Preliminary Water Quality Management Plan (PWQMP)

Project Name:

VTTM 19390

PROSPECT AVENUE AND 17TH STREET

TUSTIN, CA 92780

Prepared for:

KINGSBARN CAPITAL & DEVELOPMENT

2500 SAND HILL ROAD, SUITE 320

MENLO PARK, CA 94025

(650) 782-3300

Prepared by:

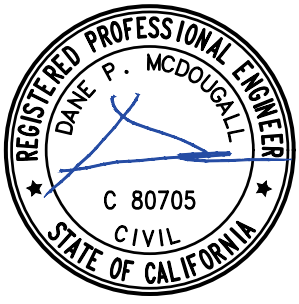
C&V CONSULTING, INC.

Engineer DANE MCDOUGALL, P.E. Registration No. C 80705

9830 IRVINE CENTER DRIVE

IRVINE, CA 92618

(949) 916-3800



Prepared: FEBRUARY 2025

Revised: MAY 2025

WQMP2025-00006

Project Owner's Certification

Permit/Application No.	TBD	Grading Permit No.	TBD
Tract/Parcel Map No.	VTTM 19390	Building Permit No.	TBD
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract)			APN 401-401-12, 13, 14, 15, 16, & 17

This Preliminary Water Quality Management Plan (WQMP) has been prepared for Kingsbarn Capital and Development by C&V Consulting, Inc. The WQMP is intended to comply with the requirements of the local NPDES Stormwater Program requiring the preparation of the plan and with the requirements of the California Environmental Quality Act (CEQA) to address and assess the impacts of storm water runoff and propose mitigation recommendations as part of the environmental element of the entitlement review of the project.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of the Final WQMP and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. An appropriate number of approved and signed copies of this document shall be available on the subject site in perpetuity.

Owner:			
Title			
Company	Kingsbarn Capital and Development		
Address	2500 Sand Hill Road, Suite 320 Menlo Park, Ca 94025		
Email			
Telephone #	650.782.94025		
Signature		Date	

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Attachments

Section I Discretionary Permit(s) and Water Quality Conditions

Project Infomation			
Permit/Application No.		Tract/Parcel Map No.	VTTM 19390, Lot 1
Additional Information/ Comments:	Prospect Avenue and 17th Street Tustin, CA 92780 APN: 401-401-12, 13, 14, 15, 16, & 17 This Preliminary WQMP is intended to serve as a part of the environmental documentation for the project as required under CEQA.		
Water Quality Conditions			
Water Quality Conditions (list verbatim)	Water Quality Conditions of Approval have not been provided at this time.		
Watershed-Based Plan Conditions			
Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	n/a		

Section II Project Description

II.1 Project Description

Description of Proposed Project		
Development Category (Verbatim from WQMP):	All significant redevelopment projects, where significant redevelopment is defined as projects that include the addition or replacement of 5,000 square feet or more of impervious surface on a developed site. Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of the facility, or emergency redevelopment activity required to protect public health and safety. If the redevelopment results in the addition or replacement of less than 50 percent of the impervious area on-site and the existing development was not subject to WQMP requirement, the numeric sizing criteria discussed in Section 7.II-2.0 only applies to the addition or the replacement area. If the addition or replacement accounts for 50 percent or more of the impervious area, the Project WQMP requirements apply to the entire development.	
Project Area (ft^2): 372168.65 sf	Number of Dwelling Units: 145	SIC Code: n/a
Narrative Project Description:	The total project area consists of approximately 8.54 acres and is located at the southeast corner of Prospect Avenue and 17th Street in the City of Tustin, California. The existing site consists of five (5) office buildings with parking and planted medians throughout. The existing building roof coverage is approximately 99,480 square feet and the remainder of the site is approximately 23,0208 square feet of impervious coverages such as asphalt/ PCC pavement for parking and 42,481 square feet of pervious landscaped areas. The existing building and impervious pavement will be demolished Kingsbarn Capital and Development as part of this development. The site is bounded by Prospect Avenue to the west, 17th Street to the north, and single-family residences to the east and south. Existing perimeter controls consist of a concrete screen wall along the southern property line and a concrete screen wall and wood fencing along the eastern property line. The project proposes the construction of one hundred forty-five (145) multi-family condominium units with open space areas that will incorporate landscaping to the maximum extent feasible. The project proposes onsite private drive aisles, parking areas, hardscaping, and landscaping, which can be accessed from the main entrance from the public right-of-way of Prospect Avenue. Drive aisles and parking areas will be asphalt concrete pavement, and	

<table>
<tr><td></td><td colspan="4">sidewalk areas will be Portland concrete cement (PCC). Landscaping, including vegetation and trees, will be incorporated into open space areas. Open space areas and landscape areas will be maintained by an appointed property management company. Long-term maintenance will be managed by an appointed Homeowner's Association selected by Kingsbarn Capital and Development.

The project will be serviced by onsite public water system and onsite private sanitary sewer system. The proposed public water system will have one point of connection to the existing city domestic water line within Prospect Avenue. The proposed private sewer system will be gravity fed to one point of connection to the city sanitary sewer main within Prospect Avenue. The private sewer system will be maintained by the private management company.

Refer to the separately prepared Preliminary Hydrology & Hydraulic Study by C&V Consulting, Inc. for additional information related to existing and proposed hydrologic conditions.</td></tr>
<tr><td rowspan="2">Project Area</td><td colspan="2">Pervious</td><td colspan="2">Impervious</td></tr>
<tr><td>Area
(acres or sq ft)</td><td>Percentage</td><td>Area
(acres or sq ft)</td><td>Percentage</td></tr>
<tr><td>Pre-Project Conditions</td><td>0.94 ac</td><td>11%</td><td>7.60 ac</td><td>89%</td></tr>
<tr><td>Post-Project Conditions</td><td>0</td><td>0%</td><td>8.54</td><td>100%</td></tr>
<tr><td>Drainage Patterns/Connections</td><td colspan="4">The existing site is graded so that runoff flows overland away from the existing buildings into adjacent valley gutters which convey runoff to the southwest corner of the site. There is an existing parkway culvert that discharges onsite runoff into the right-of-way of Prospect Avenue.

According to the Orange County Flood Control Facility Maps the nearest downstream catch basin is located just south of the property line on Prospect Avenue. This catch basin connects to a 30-inch Orange County Flood Control District RCP that confluences with the North Tustin Channel just north of Beneta Way. Runoff continues to flow in the North Tustin Channel until it reaches the El Modena-Irvine Channel (OCFCD, F07) east of Holt Avenue. Runoff Enters Peters Canyon Channel (OCFCD, F06) and then the San Diego Creek Channel (OCFCD, F06), ultimately discharging to the Upper Newport Bay/ Pacific Ocean. This site is located within the San Diego Creek Watershed per the Orange County Flood Control District (OCFCD) Drainage System Map No. 30.

All existing onsite storm drain connections, piping and inlets will be demolished and capped at the right-of-way as part of this development's</td></tr>
</table>

Drainage Patterns/Connections (cont.)	construction. In the proposed condition, site runoff will be captured by nine (9) proposed sump curb inlet catch basins and five (5) proposed grate inlets. Low flows will be conveyed via dvert pipes into nearby modular wetland units for water quality treatment. When the water quality treatment flow rate is exceeded, runoff will be directed through the proposed underground storm drain system. The modular wetland units will also be equipped with internal bypass for flows that exceed the treatment flow rate. All runoff will be directed into a proposed storm drain sump pump located at the project entrance which will discharge runoff through a proposed parkway drain into Prospect Avenue at pre developed flow rates. During larger storm events, runoff will pond at the proposed catch basins near the entry driveway and discharge into the public right-of-way of Prospect Avenue. Upon entering surrounding streets, site stormwater runoff will follow the historic drainage path to the Upper Newport Bay/ Pacific Ocean. Site has been designed based on a 1 lot subdivision for condominium purposes. If developer choices to file multiple final maps for the site, a drainage agreement between properties would be required. The Connector Pipe Screen (CPS) devices will be located onsite upstream of the proposed storm drain overflow pipes to mitigate the required full trash captures requirements. According to the Federal Emergency Management Agency (FEMA), FIRM rate map Number 06059C0164J, revised December 3, 2009, the site is located within the flood zone as follows: Zone X – "0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot with drainage areas of less than one square mile." Refer to the Preliminary WQMP Exhibit in Attachment B of this report for the Modular Wetland System locations.

II.2 Potential Stormwater Pollutants

Pollutants of Concern			
Pollutant	Circle One: E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended-Solid/ Sediment	E	N	Expected due to residential use and proposed landscaping per Table 2.1 of the TGD.
Nutrients	E	N	Expected due to residential use and proposed landscaping per Table 2.1 of the TGD.
Heavy Metals	E	N	Not tributary by Attached Residential Developments per Table 2.1 of the TGD.
Pathogens (Bacteria/Virus)	E	N	Expected due to residential use and proposed parking areas/ drive aisle per Table 2.1 of the TGD.
Pesticides	E	N	Expected due to residential use and proposed landscaping per Table 2.1 of the TGD.
Oil and Grease	E	N	Expected due to residential use and proposed parking areas/ drive aisle per Table 2.1 of the TGD.
Toxic Organic Compounds	E	N	Expected due to residential use and proposed parking areas/ drive aisle per Table 2.1 of the TGD.
Trash and Debris	E	N	Expected due to residential use per Table 2.1 of the TGD.

II.3 Hydrologic Conditions of Concern

☐ No – Show map

☒ Yes – Describe applicable hydrologic conditions of concern below. *Refer to Section 2.2.3 in the TGD.*

Per Section 5.3.1 of the Technical Guidance, the following calculations were developed:

1. $(V_{2\text{-year, post}} / V_{2\text{-year, pre}}) \leq 1.05$

   (49,919.03 cf / 52,268.16 cf) = 0.96 ≤ 1.05✓

2. $(Tc_{2\text{-year, pre}} / Tc_{2\text{-year, post}}) \leq 1.05$

   (11.27 min/ 17.88 min) = 0.63 ≤ 1.05 ✓

3. $(Q_{2\text{-year, post}} / Q_{2\text{-year, pre}}) \leq 1.05$

   (7.297 cfs/ 10.615 cfs) = 0.69 ≤ 1.05 ✓

Refer to Attachment F of this report for supporting hydrology calculations for the pre- and post-developed conditions. The 2-year Volume, Time of Concentration and Peak Flow Rate calculations were analyzed utilizing methods per the Orange County Hydrology Manual, Orange County TGD and Model WQMP.

Refer to Attachment B of this report for a copy of the TGD Figure XVI-4, Susceptibility Analysis of Newport Bay-Newport Coastal Streams, HCOC Map dated February 2013. The proposed drainage path of travel has been indicated by arrows on the map. Portions of Peters Canyon Channel is susceptible to Hydromodification requirements.

Per Section 2.2.3 of the Technical Guidance, HCOC's are considered to exist if any streams located downstream from the project are determined to be potentially susceptible to hydromodification impacts and either the post-development runoff volume and/ or peak flow rate exceeds the pre-development condition or time of concentration of the post-development runoff is less than the pre-development condition for the 2-yr, 24-hr storm event.

The post-development 2-year storm event volume, the time of concentration, and peak flow rate decreased compared to the pre-developed conditions, therefore HCOC's are not required for this site.

II.4 Post Development Drainage Characteristics

Post–development drainage will be consistent with a proposed attached Multi-Family Residential project. The tributary areas and direction stormwater runoff for the proposed site are delineated within the Preliminary WQMP Exhibit based on the preliminary grading and drainage design. Refer to the Preliminary WQMP Exhibit in Attachment B of this report.

Currently, the site drains overland towards existing southwest corner of the site and overflows through an existing parkway drain into the public right-of-way of Prospect Avenue. Two drain inlets are present onsite, and it is likely these connect to storm drain facilities within Prospect Avenue.

In the proposed condition, site runoff will be captured by nine (9) proposed sump curb inlet catch basins and five (5) proposed grate inlets. Low flows will be conveyed via dvert pipes into nearby modular wetland units for water quality treatment. When the water quality treatment flow rate is exceeded, runoff will be directed through the proposed underground storm drain system. The modular wetland units will also be equipped with internal bypass for flows that exceed the treatment flow rate. All runoff will be directed into a proposed storm drain sump pump located at the project entrance which will discharge runoff through a proposed parkway drain into Prospect Avenue at pre developed flow rates. During larger storm events, runoff will pond at the proposed catch basins near the entry driveway and discharge into the public right-of-way of Prospect Avenue. Upon entering surrounding streets, site stormwater runoff will follow the historic drainage path to the Upper Newport Bay/ Pacific Ocean.

Site has been designed based on a 1 lot subdivision for condominium purposes. If developer choices to file multiple final maps for the site, a drainage agreement between properties would be required.

II.5 Property Ownership/Management

The property is currently owned by Kingsbarn Capital and Development. The Owner will be responsible for the long-term maintenance of the project's storm water facilities and conformance to this WQMP after construction is complete.

A City Covenant is in Attachment G of this report and should be executed as part of any ownership transfer after construction is complete.

Kingsbarn Capital and Development will appoint a Homeowner's Associated (HOA) to provide long term BMP maintenance for the proposed development. Refer to Section V for additional maintenance information.

Section III Site Description

III.1 Physical Setting

Name of Planned Community/Planning Area (if applicable)	Cypress Grove
Location/Address	17772, 17782, 17852, 17862, 17822 17th Street
	Tustin, CA 92670
General Plan Land Use Designation	PCCB - Planned Community Commercial/ Business
Zoning	Planned Community Commercial (PC COM)
Acreage of Project Site	8.54 ac
Predominant Soil Type	Soil Type A per NRCS Hydrology Soil Groups, TGD Figure XVI-2a. Refer to Attachment B.

III.2 Site Characteristics

Precipitation Zone	0.8" (Refer to Figure XVI-1 of the TGD located in Attachment B of this report for reference of rainfall zone.)
Topography	The site is generally flat with elevations above sea level as high as 163.6 near the mid-point of the site to as low as 160.6 near the southwest corner of the site. The existing site consists of five (5) office buildings with associated parking and planted medians throughout.
Drainage Patterns/Connections	The existing site is flat in nature with the stormwater flowing towards in the southwest direction. There are two inlets on the southern end of the site. It is likely that these inlets connect to storm drain facilities in Prospect Avenue. All other stormwater runoff is conveyed to the public right-of-way of Prospect Avenue through a parkway culvert.
Soil Type, Geology, and Infiltration Properties	Per the Preliminary Geotechnical Report prepared by Langan CA, Inc dated September 6, 2024, the following subsurface soil conditions were encountered: "LANGAN's interpretation of the subsurface conditions is based on soils encountered during our field investigation. In general, subsurface conditions within the Site consisted of undocumented, artificial fill underlain by native, old alluvial fan deposits. Our interpretation of the subsurface conditions based on the borings and laboratory test results is summarized below. • Artificial Fill – Artificial, undocumented fill was encountered under the asphalt pavement to a depth of approximately 3 to 4 feet bgs. In general, the fill encountered at the site consisted of brown, medium stiff, clay, and tannish brown, poorly graded sand, with varying amounts of cobbles and silt, possibly due to the prior agricultural use of the site. • Old Alluvial Fan Deposits – Pleistocene-age older fan deposits were encountered under the fill. The fan deposits generally consist of dense to very dense, grayish to brown, poorly graded sand with varying amounts of gravel and cobbles, and stiff to hard, brown clay that extends to the maximum explored depth of approximately 51½ feet bgs. Localized lenses of medium dense sand were encountered within the upper approximately 25 feet. The clay that comprises the upper portion (depths of approximately 3 to 7 feet) of the fan deposits is soft to medium stiff." Per the "Geotechnical Review of Vesting Tentative Tract Map 19390" prepared by NMG Geotechnical Inc, the following subsurface soil conditions were encountered:

	The subject site is located on the eastern margins of the Los Angeles Basin, within the floodplains of Santiago Creek and the Santa Ana River. The site is located on an area of older alluvial fan material composed primarily of sands and gravels (Morton and Miller, 2006) as shown on Figure 3. The thickness of Quaternary material below the site is approximately 400 feet (CDMG, 1980). The older alluvial material is overlain by a thin veneer of undocumented fill, placed during construction of the current office buildings. The existing artificial undocumented fill at the site is 3 to 5 feet thick. This material generally consists of brown to dark brown, sandy clay and clayey sand, that is damp to moist, and medium dense/stiff. The Quaternary-aged older alluvium consists of a heterogeneous mixture of gravels, silts, clays, and sands. The upper 5 to 20 feet of alluvium site is primarily composed of sandy fine to coarse gravel that is damp, and very dense with little to no organics. The consistency of this gravel between each boring suggests the gravel is consistent across the site from depths of 5 to 20 feet and deeper. Between 20 and 50 feet bgs, there are layers of sandy gravels, silts and sandy clays that are damp, and dense to hard. Refer to the project specific Soils Report in Attachment E of this report.

Site Characteristics (continued)	
Hydrogeologic (Groundwater) Conditions	Per the Preliminary Geotechnical Report prepared by Langan CA, Inc dated September 6, 2024, the following groundwater conditions were encountered: Groundwater – Groundwater was not encountered during the field investigation to the maximum explored depth of 51½ feet bgs. The depth to historic high groundwater is mapped to be on the order of 40 feet bgs." Per the "Geotechnical Review of Vesting Tentative Tract Map 19390" prepared by NMG Geotechnical Inc, the following groundwater conditions were encountered: "Groundwater was not encountered during our subsurface exploration to a maximum depth of 50.8 feet bgs. Additionally, Langan did not encounter groundwater in any of their borings to a maximum depth of 51.5 feet. Historic high groundwater is in excess of 40 feet deep below the site (CDMG, 1997). The present groundwater table is estimated to be greater than 100 feet deep based on data from a remediation well located 0.4 miles to the west of the site (Arcadis, 2015). A groundwater monitoring well is located 1.3 miles to the northwest at Portola Park with current groundwater depths approximately 160 feet bgs. "

	Refer to the project specific Soils Report in Attachment E of this report.
Geotechnical Conditions (relevant to infiltration)	Per the Preliminary Geotechnical Report prepared by Langan CA, Inc dated September 6, 2024, the following subsurface soil conditions were encountered: "The Site is generally underlain by clay and poorly graded sand with varying amounts of gravel, cobbles, and silt. Based on our evaluation of the soils underlying the site and the laboratory test results, we preliminarily conclude that stormwater infiltration into the fill and upper clays of the fan deposits is generally not feasible at the site. However, it could be possible to infiltrate into the sand, which was encountered at an approximate depth of seven feet bgs. If dry wells are used, they should be minimum of eight feet away from building foundations. It is estimated that the clay layers will have low infiltration rates while the sand layers will have high infiltration rates. According to the Caltrans Infiltration Basin Design Guidance, typical infiltration rates, including a factor of safety of 4, for a clay material can be up to 0.1 inches per hour, and between ½ to 2 inches per hour for sands. The bulk samples collected during drilling were sufficiently fine-grained such that the Hazen formula, which empirically correlates permeability and grain size, could not be applied. The infiltration rates and feasibility provided herein should be confirmed based on field testing (i.e. percolation tests or infiltration tests) once location of stormwater infiltration design, locations, and plan depths have been selected. LANGAN should also review the stormwater infiltration design for potential impacts to the proposed foundation design." Refer to the project specific Soils Report in Attachment E of this report.
Off-Site Drainage	There is no off-site drainage enters the site due to existing perimeter stormwater conveyance controls.
Utility and Infrastructure Information	All stormwater flows overland in a southwest direction towards the public right-of-way of Prospect Avenue. Storm drain and sanitary sewer will be private for the proposed site. Domestic Water will be public and owned/ maintained by the City of Tustin. Sanitary sewer will have connection point to the existing system within Prospect Avenue. All utilities are proposed to be underground. Site has been designed based on a 1 lot subdivision for condominium purposes. If developer choices to file multiple final maps for the site, a drainage agreement between properties would be required. If site to be developed with phasing, entire all portions of the drainage system, including downstream shall be installed and fully operational to support certificate of occupancies.

III.3 Watershed Description

Receiving Waters	North Tustin Channel, Modena-Irvine Channel, Peters Canyon Channel; San Diego Creek Reach 1; San Diego Creek Reach 2; Upper Newport Bay, Lower Newport Bay
303(d) Listed Impairments	Peter Canyon Channel is listed for: Pesticides (DDT and Toxaphene), Fecal Indicator Bacteria (Indicator Bacteria), and pH. San Diego Creek Reach 1 is listed for: Fecal Indicator Bacteria (Fecal Coliform), Nutrients (Nutrients), Pesticides (Pesticides and Toxaphene), Sediment (Sedimentation/Siltation), and Metals (Selenium) San Diego Creek Reach 2 is listed for: Fecal Indicator Bacteria (Indicator Bacteria), Nutrients (Nutrients), Sediment (Sedimentation/Siltation), and Toxicity (Unknown Toxicity) Upper Newport Bay is listed for: Pesticides (Chlordane, DDT, and Pesticides), Metals (Copper and Metals), Fecal Indicator Bacteria (Indicator Bacteria), Nutrients (Nutrients), Other Organics (PCBs), Toxicity (Sediment Toxicity), and Sediment (Sedimentation/Siltation) Lower Newport Bay is listed for: Pesticides (Chlordane, DDT, and Pesticides), Metals (Copper), Fecal Indicator Bacteria (Indicator Bacteria), Nutrients (Nutrients), Other Organics (PCBs), and Toxicity (Sediment Toxicity).
Applicable TMDLs	Nutrients, Pesticides, Sediment, Toxicity, Pathogens (Bacteria/Virus)
Pollutants of Concern for the Project	Suspended Solid/Sediments, Nutrients, Pathogens (Bacteria/Virus), Pesticides, Toxic Organic Compounds
Environmentally Sensitive and Special Biological Significant Areas	The project is not located within any known Environmentally Sensitive Areas (ESA) or Areas of Special Biological Significance (ASBS) per the Watershed F: San Diego Creek Environmentally Sensitive Area Map provided within Attachment B.

Section IV Best Management Practices (BMPs)

IV. 1 Project Performance Criteria

(NOC Permit Area only) Is there an approved WIHMP or equivalent for the project area that includes more stringent LID feasibility criteria or if there are opportunities identified for implementing LID on regional or sub-regional basis?		YES ☐	NO ☒
If yes, describe WIHMP feasibility criteria or regional/sub-regional LID opportunities.	n/a		

Project Performance Criteria (continued)	
If HCOC exists, list applicable hydromodification control performance criteria (Section 7.II-2.4.2.2 in MWQMP)	Per 7.II-2.4.2.2 of the MWQMP, HCOC exists for when the post-construction time of concentration decreases beyond 5% of a 2-year storm event and volume of storm water increases beyond 5% of a 2-year storm event thus potentially increasing the downstream erosion and adversely impacts on physical structure, aquatic, and riparian habitat. However, a site that infiltrates at least the runoff from a two-year storm event does not have an HCOC If the excess volume cannot feasibly be retained, then retain the excess volume from the two-year runoff event to the maximum extent possible and implement on-site hydromodification controls such that post development runoff two-year peak flow rate is not greater than 110 percent of the predevelopment runoff two-year peak flow rate.
List applicable LID performance criteria (Section 7.II-2.4.3 from MWQMP)	According to Section 7.II-2.4.3 of the MWQMP, the available LID Treatment BMPs to be utilized in reducing the post-development impacts include infiltration, harvest, and use, evapotranspiration, or biotreat/biofilter, the 85th percentile of a 24-hour storm event. This project proposes to utilize Biotreatment BMPs to treat the required stormwater runoff
List applicable treatment control BMP performance criteria (Section 7.II-3.2.2 from MWQMP)	If it is not feasible to meet LID performance criteria through retention and/or biotreatment provided on-site or at a sub-regional/regional scale, then treatment control BMPs shall be provided on-site or off-site prior to discharge to waters of the US. Since the project proposes to satisfy LID performance criteria, therefore treatment control performance criteria are also fully satisfied. Sizing of treatment control BMPs (Biofiltration Systems) shall be based flow-based for the area being redeveloped to medium and high effectiveness for reducing the primary pollutants of concern, which will be considered in compliance. This project proposes to utilize Biotreatment BMPs to treat the required storm water runoff. Refer to Attachment C for manufacturer's specifications for the proposed Biofiltration BMP. Refer to Section IV.3.4, Biotreatment BMPs for additional information regarding BMP selection.
Calculate LID design storm capture volume for Project.	Biotreatment BMPs will be utilized for onsite treatment of the water quality design flow rate. The proposed project residential site will generate a total DCV of 22,322 cf. DMA 1: Vdesign = (0.9)(0.8)(0.771 ac)(43,560 sf/ac)(1 ft/12 in) = 2,014 cf DMA 2: Vdesign = (0.9)(0.8)(0.852 ac)(43,560 sf/ac)(1 ft/12 in)= 2,228 cf DMA 3: Vdesign = (0.9)(0.8)(1.38ac)(43,560 sf/ac)(1 ft/12 in)= 3,607 cf DMA 4: Vdesign = (0.9)(0.8)(0.399ac)(43,560 sf/ac)(1 ft/12 in)= 1,042 cf DMA 5: Vdesign = (0.9)(0.8)(0.335ac)(43,560 sf/ac)(1 ft/12 in)= 876 cf

	DMA 6: Vdesign = (0.9)(0.8)(0.502ac)(43,560 sf/ac)(1 ft/12 in)= 1,311 cf DMA 7: Vdesign = (0.9)(0.8)(1.025ac)(43,560 sf/ac)(1 ft/12 in)= 2,678 cf DMA 8: Vdesign = (0.9)(0.8)(0.368ac)(43,560 sf/ac)(1 ft/12 in)= 961 cf DMA 9: Vdesign = (0.9)(0.8)(0.283ac)(43,560 sf/ac)(1 ft/12 in)= 739 cf DMA 10: Vdesign = (0.9)(0.8)(1.311ac)(43,560 sf/ac)(1 ft/12 in)= 3,427 cf DMA 11: Vdesign = (0.9)(0.8)(0.578ac)(43,560 sf/ac)(1 ft/12 in)= 1,512 cf DMA 12: Vdesign = (0.9)(0.8)(0.305ac)(43,560 sf/ac)(1 ft/12 in)= 798 cf DMA 13: Vdesign = (0.9)(0.8)(0.432ac)(43,560 sf/ac)(1 ft/12 in)= 1,130 cf Due to infiltration being infeasible at the site, biofiltration vaults will treat the required water quality design flow rate. The site will generate a total water quality design flowrate of 2.231 cfs. DMA 1: Qdesign = (0.90)(0.26 in/hr)(0.77 ac) = 0.180 cfs DMA 2: Qdesign = (0.90)(0.26 in/hr)(0.852 ac) = 0.199 cfs DMA 3: Qdesign = (0.90)(0.26 in/hr)(1.383 ac) = 0.323 cfs DMA 4: Qdesign = (0.90)(0.26 in/hr)(0.399 ac) = 0.093 cfs DMA 5: Qdesign = (0.90)(0.26 in/hr)(0.335 ac) = 0.078 cfs DMA 6: Qdesign = (0.90)(0.26 in/hr)(0.502 ac) = 0.117 cfs DMA 7: Qdesign = (0.90)(0.26 in/hr)(1.025 ac) = 0.240 cfs DMA 8: Qdesign = (0.90)(0.26 in/hr)(0.368 ac) = 0.086 cfs DMA 9: Qdesign = (0.90)(0.26 in/hr)(0.283 ac) = 0.066 cfs DMA 10: Qdesign = (0.90)(0.26 in/hr)(1.311 ac) = 0.307 cfs DMA 11: Qdesign = (0.90)(0.26 in/hr)(0.578 ac) = 0.135 cfs DMA 12: Qdesign = (0.90)(0.26 in/hr)(0.305 ac) = 0.071 cfs DMA 13: Qdesign = (0.90)(0.26 in/hr)(0.432 ac) = 0.101 cfs See Attachment A of this report for DCV and treatment flow rate calculations.

IV.2. SITE DESIGN AND DRAINAGE PLAN

The site proposes thirteen (13) Drainage Management Areas (DMAs) as indicated on the WQMP Exhibit. The DMAs are based on the Grading and Drainage design. Each DMA will have an area drain system to collect and convey runoff from landscape, surface, and roof drainage to the proposed treatment devices. Pervious coverages located throughout the site will promote impervious area dispersion from roof and sidewalk runoff.

Street surface runoff will be collected and conveyed through a curb inlet catch basins equipped with a Dvert System that will divert low flows to proposed Modular Wetlands System (MWS) Biofiltration vaults for water quality treatment. During larger storm events when the proposed biofiltration BMPs are at capacity, stormwater will pond within the catch basins near the project entry which will overflow into the public right-of-way of Prospect Avenue.

The Modular Wetland System (MWS) Biofiltration vaults are designed to provide a 3-phase treatment train. Initially, when the stormwater enters the system, a trash rack, filter media and settling chamber will capture large trash/ debris and sediment in the stormwater before entering the planting media. This system is designed to treat stormwater flow horizontally. Before the stormwater enters the planting or "wetland" chamber, the runoff flows through the 2nd phase, a pre-filter cartridge which captures fines TSS, metals, nutrients, and bacteria. The pre-filter chamber eliminates additional maintenance of the planting area. The wetland chamber is the 3rd phase of the system which provides final treatment through a combination of physical, chemical, and biological processes. Refer to Section IV.3.4 of this report for sizing information of the Biofiltration Vaults.

Connector Pipe Screen (CPS) devices will be located onsite upstream of the proposed storm drain overflow pipes to mitigate the required full trash captures requirements.

Refer to Worksheet B in Attachment A of this report.

IV.3 LID BMP SELECTION AND PROJECT CONFORMANCE ANALYSIS

IV.3.1 Hydrologic Source Controls

Name	Included?
Localized on-lot infiltration	☐
Impervious area dispersion (e.g. roof top disconnection)	☐
Street trees (canopy interception)	☐
Residential rain barrels (not actively managed)	☐
Green roofs/Brown roofs	☐
Blue roofs	☐
Impervious area reduction (e.g. permeable pavers, site design)	☐
Other:	☐

** HSC BMPs are not required since proposed conditions peak flow rate, time of concentration and volume is less than the existing condition. Refer to Attachment B, F and Section 11.3 of this report for additional information.*

IV.3.2 Infiltration BMPs

Name	Included?
Bioretention without underdrains	☐
Rain gardens	☐
Porous landscaping	☐
Infiltration planters	☐
Retention swales	☐
Infiltration trenches	☐
Infiltration basins	☐
Drywells	☐
Subsurface infiltration galleries	☐
French drains	☐
Permeable asphalt	☐
Permeable concrete	☐
Permeable concrete pavers	☐
Other:	☐
Other:	☐

Infiltration BMPs will not be utilized and have been determined to be infeasible for this site due to low infiltration rates. Biotreatment BMPs will be utilized to provide the required treatment flow rates.

Refer to Table 2.7 Infiltration BMP Feasibility Worksheet located within Attachment A for additional information.

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

Name	Included?
All HSCs; *See Section IV.3.1*	☐
Surface-based infiltration BMPs	☐
Biotreatment BMPs	☒
Above-ground cisterns and basins	☐
Underground detention	☐
Other:	☐
Other:	☐
Other:	☐

Evapotranspiration, Rainwater Harvesting BMPs will not be utilized and have been determined to be infeasible for this site due to development type, density and available amount of landscaped area for irrigation purposes. Refer to Worksheet J for feasibility calculations within Attachment A of this report. Biotreatment BMPs will be utilized to provide the required treatment flow rates.

IV.3.4 Biotreatment BMPs

Name	Included?
Bioretention with underdrains	☐
Stormwater planter boxes with underdrains	☐
Rain gardens with underdrains	☐
Constructed wetlands	☐
Vegetated swales	☐
Vegetated filter strips	☐
Proprietary vegetated biotreatment systems	☒
Wet extended detention basin	☐
Dry extended detention basins	☐
Other:	☐
Other:	☐

Proprietary Vegetated Biotreatment Systems:

Modular Wetland System (MWS) Biofiltration curb inlets will be utilized to capture and treat the stormwater runoff before leaving the site. The MWS Biofiltration system utilizes a 3-phase treatment train by collecting the stormwater runoff in a Pre-Treatment Chamber, Planting or "Wetland" Chamber and Discharge Chamber. Treated storm water runoff will be pumped and discharged into a proposed parkway drain on Prospect Avenue..

Refer to Attachment C for additional manufacturer's BMP information.

The MWS Biofiltration curb inlet systems were sized based on the treatment flow rate method per the Orange County Technical Guidance Document worksheets. Refer to Worksheet D in Attachment A for calculations.

DMA	Area (ac)	Required Treatment, Q (cfs)	MWS Model	Treatment Capacity, Q (cfs)
DMA 1	0.771	0.180	MWS-L-8-8-3.4	0.231
DMA 2	0.852	0.199	MWS-L-8-8-3.4	0.231
DMA 3	1.383	0.323	MWS-L-8-12-3.4	0.346
DMA 4	0.399	0.093	MWS-L-4-8-3.4	0.115
DMA 5	0.335	0.078	MWS-L-4-6-3.7	0.079
DMA 6	0.502	0.117	MWS-L-4-8-3.5	0.115
DMA 7	1.025	0.240	MWS-L-8-8-3.6	0.245
DMA 8	0.368	0.086	MWS-L-4-8-3.4	0.115
DMA 9	0.283	0.066	MWS-L-4-6-3.4	0.073
DMA 10	1.311	0.307	MWS-L-8-12-3.4	0.346
DMA 11	0.578	0.135	MWS-L-6-8-3.4	0.147
DMA 12	0.305	0.071	MWS-L-4-6-3.4	0.073
DMA 13	0.432	0.101	MWS-L-4-8-3.4	0.115

**A project-specific Modular Wetlands System (MWS) Biofiltration curb inlet detail will be provided during final engineering. Refer to additional manufacturer sizing information located within Attachment C of this report.*

Treated storm water runoff discharging from the MWS Biofiltration vault will enter a proposed stormwater sump pump system designed to meet the treatment flow rate. Pump sizing and details will be provided during final engineering.

Refer to Section V and Attachment E within this report for the project-specific Operation and Maintenance (O&M) Plan.

IV.3.5 Hydromodification Control BMPs

Hydromodification Control BMPs	
BMP Name	**BMP Description**
n/a	n/a

IV.3.6 Regional/Sub-Regional LID BMPs

Regional/Sub-Regional LID BMPs
n/a

IV.3.7 Treatment Control BMPs

Treatment Control BMPs	
BMP Name	**BMP Description**
Connector Pipe Screen (CPS) Device	Connector Pipe Screen (CPS) device will be utilized prior to the proposed overflow storm drain pipe to provide full trash capture requirements.

IV.3.8 Non-structural Source Control BMPs

Non-Structural Source Control BMPs				
Identifier	**Name**	**Check One**		**If not applicable, state brief reason**
		Included	**Not Applicable**	
N1	Education for Property Owners, Tenants, and Occupants	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☒	☐	
N6	Local Industrial Permit Compliance	☐	☒	Residential development
N7	Spill Contingency Plan	☒	☐	
N8	Underground Storage Tank Compliance	☐	☒	Residential development
N9	Hazardous Materials Disclosure Compliance	☐	☒	Residential development, no hazardous materials proposed
N10	Uniform Fire Code Implementation	☒	☐	
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☒	☐	
N13	Housekeeping of Loading Docks	☐	☒	Residential development
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☒	☐	
N16	Retail Gasoline Outlets	☐	☒	Residential development

IV.3.9 Structural Source Control BMPs

Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
S1	Provide storm drain system stenciling and signage	☒	☐	
S2	Design and construct outdoor material storage areas to reduce pollution introduction	☐	☒	No proposed outdoor storage areas
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☐	☒	No proposed trash enclosures
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☐	☒	No proposed slopes/ channels to be protected
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)	☐	☒	n/a
S6	Dock areas	☐	☒	No proposed dock areas
S7	Maintenance bays	☐	☒	No proposed maintenance bays
S8	Vehicle wash areas	☐	☒	No proposed vehicle wash areas
S9	Outdoor processing areas	☐	☒	No proposed outdoor processing areas
S10	Equipment wash areas	☐	☒	No proposed equipment wash areas

S11	Fueling areas	☐	☒	No proposed fueling areas
S12	Hillside landscaping	☐	☒	No proposed hillside landscaping
S13	Wash water control for food preparation areas	☐	☒	No proposed wash water for food processing areas
S14	Community car wash racks	☐	☒	No proposed community car wash racks

S1 (CASQA Fact Sheet SD-13): Storm Drain Stenciling & Signage

HOA to inspect, repair and/ or replace storm drain stenciling and signage immediately. Inspection of stenciling and signage shall occur at least once per month and prior to the start of the rainy season. Storm Drain stenciling and signage with a reference that indicates "Drains to Ocean" per CASQA BMP SD-13 Fact Sheet is required.

S4 (CASQA Fact Sheet SD-12): Use Efficient Irrigation Systems & Landscape Design

HOA shall implement the timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm drain systems. HOA to implement the following methods to reduce excessive irrigation water runoff, where applicable:

- Employ rain shutoff devices to prevent irrigation after precipitation
- Utilizing landscape specific irrigation water requirements
- Utilize flow reducers or shutoff valves triggered by pressure drop to control water loss due to broken sprinkler heads
- Implement landscaping practices per the County Water Conservation Resolution or City agency equivalent
- Group plants or landscaping with similar water consumption to promote surface infiltration

Refer to CASQA BMP Fact Sheet SD-12 for additional information.

IV.4 ALTERNATIVE COMPLIANCE PLAN (IF APPLICABLE)

IV.4.1 Water Quality Credits

<table>
<tr><th colspan="5">Description of Proposed Project</th></tr>
<tr><td colspan="5">Project Types that Qualify for Water Quality Credits (Select all that apply):</td></tr>
<tr><td colspan="2">☐Redevelopment projects that reduce the overall impervious footprint of the project site.</td><td colspan="2">☐Brownfield redevelopment, meaning redevelopment, expansion, or reuse of real property which may be complicated by the presence or potential presence of hazardous substances, pollutants, or contaminants, and which have the potential to contribute to adverse ground or surface WQ if not redeveloped.</td><td>☐ Higher density development projects which include two distinct categories (credits can only be taken for one category): those with more than seven units per acre of development (lower credit allowance); vertical density developments, for example, those with a Floor to Area Ratio (FAR) of 2 or those having more than 18 units per acre (greater credit allowance).</td></tr>
<tr><td colspan="2">☐ Mixed use development, such as a combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that can demonstrate environmental benefits that would not be realized through single use projects (e.g. reduced vehicle trip traffic with the potential to reduce sources of water or air pollution).</td><td colspan="2">☐ Transit-oriented developments, such as a mixed use residential or commercial area designed to maximize access to public transportation; similar to above criterion, but where the development center is within one half mile of a mass transit center (e.g. bus, rail, light rail, or commuter train station). Such projects would not be able to take credit for both categories, but may have greater credit assigned</td><td>☐ Redevelopment projects in an established historic district, historic preservation area, or similar significant city area including core City Center areas (to be defined through mapping).</td></tr>
<tr><td>☐Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses.</td><td>☐ Developments in a city center area.</td><td>☐ Developments in historic districts or historic preservation areas.</td><td>☐ Live-work developments, a variety of developments designed to support residential and vocational needs together – similar to criteria to mixed use development; would not be able to take credit for both categories.</td><td>☐In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.</td></tr>
</table>

Calculation of Water Quality Credits (if applicable)	Water Quality credits will not be utilized on this development site.

IV.4.2 Alternative Compliance Plan Information

n/a

Section V Inspection/Maintenance Responsibility for BMPs

The property is currently owned by Kingsbarn Capital & Development. The Owner will be responsible for the long-term maintenance of the project's storm water facilities and conformance to this WQMP after construction is complete.

A City of Tustin Covenant is located in Attachment G of this report and should be executed as part of any ownership transfer after construction is complete.

The owner will appoint a Homeowner's Association (HOA) to provide long term BMP maintenance for the proposed development upon completion of construction.

Owner/ Developer:
Kingsbarn Capital & Development
2500 Sand Hill Road, Suite 320
Menlo Park, CA 94025
(650) 782-3300

Homeowner's Association
To be determined

The owner is aware of the maintenance responsibilities of the proposed BMPs. A funding mechanism is in place to maintain the BMPs at the frequency stated in the WQMP.

CC&R review/ approval to be provided during final engineering.

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
Education for Property Owners, Tenants, Occupants & Employees	Kingsbarn Capital & Development (Owner)/ HOA	HOA to provide education material, a copy of the approved WQMP and Operation & Maintenance Plan (O&M) to new property owners, tenants, occupants & employees.	At time of hiring, leasing and/ or home purchase.
Activity Restrictions	Kingsbarn Capital & Development (Owner)/ HOA	HOA employees notified of activities that are prohibited by homeowners.	Restrictions identified in Employee Manual and reviewed yearly by employees.
Common Area Landscape Management	Kingsbarn Capital & Development (Owner)/ HOA	HOA to hire professional landscape company to conduct maintenance of landscaping to meet current water efficiency and keep plants healthy and bio areas maintained with proper soil amendments.	Regular maintenance once a week and monthly inspection to determine deficiencies.
BMP Maintenance	Kingsbarn Capital & Development (Owner)/ HOA	HOA to hire professional BMP maintenance company to conduct regular inspections, repairs, and cleanings per manufacturer's specifications.	A minimum 2 inspections/ cleanings per year per manufacturer's specifications prior to October 1st (before rainy season)
Title 22 CCR Compliance	Kingsbarn Capital & Development (Owner)/ HOA	The distribution of these materials will be the responsibility of the HOA at the time of hire, lease signing or home purchase per property owner, tenant,	At time of hiring, leasing and/ or home purchase.

		or occupant or at the initial time of hiring.	
Uniform Fire Code Implementation	Kingsbarn Capital & Development (Owner)/ HOA	HOA to comply with fire regulations and keep informed of the latest rules and requirements.	Comply with annual fire inspections and maintain building and access per the latest fire codes.
Common Area Litter Control	Kingsbarn Capital & Development (Owner)/ HOA	HOA to provide litter removal of site parking lot and landscape areas and to empty communal area trash bins.	Once per week.
Employee Training	Kingsbarn Capital & Development (Owner)/ HOA	The distribution of these materials will be the reasonability of the HOA at the initial hiring of the employee.	At time of hiring.
Private Street & Parking Lot Sweeping	Kingsbarn Capital & Development (Owner)/ HOA	HOA to provide maintenance of Parking Lot and provide Street Sweeping services.	Weekly basis.
Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	Kingsbarn Capital & Development (Owner)/ HOA	HOA to provide maintenance of landscaping to meet current water efficiency standards and keep plants healthily.	Regular maintenance once a week and monthly inspection to determine any water deficiencies.
Common Area Catch Basin Inspections	Kingsbarn Capital & Development (Owner)/ HOA	HOA shall inspection communal areas where catch basins are located within the surrounding area and remove any trash/ debris.	Inspections/ Cleaning shall occur at least twice per month.

Storm Drain System Stencilling & Signage	Kingsbarn Capital & Development (Owner)/ HOA	HOA to inspect and repair as needed all onsite storm drain stencilling & signage.	Inspection should occur at minimum twice per year.
Connector Pipe Screen (CPS) Device	Kingsbarn Capital & Development (Owner)/ HOA	HOA will be required to hire a professional maintenance company to provide regular inspection, repairs, and cleaning per manufacturer's specifications. All trash/ debris and loose sediment/ silt shall be removed and screen replacement per manufacturer's specifications.	Inspections/ cleanings should occur at least two times per year and before the start of the rainy season (October 1st). Refer to Attachment C for additional information and manufacturer's specifications.
BIO-7: Modular Wetlands System (MWS) Biofiltration Vaults	Kingsbarn Capital & Development (Owner)/ HOA	Owner/ HOA will be required to hire a professional maintenance company to provide regular inspections, repairs, and cleaning per manufacturer's specifications.	Inspections/ Cleanings should occur at least two times per year and before the start of the rainy season (October 1st). Refer to Attachment C for additional information and manufacturer's specifications.

Section VI Site Plan and Drainage Plan

VI.1 SITE PLAN AND DRAINAGE PLAN

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural BMP locations
- Drainage delineations and flow information
- Drainage connections
- BMP details

VI.2 ELECTRONIC DATA SUBMITTAL

The minimum requirement is to provide submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open.

If the local jurisdiction requires specialized electronic document formats (CAD, GIS) to be submitted, this section will be used to describe the contents (e.g., layering, nomenclature, georeferencing, etc.) of these documents so that they may be interpreted efficiently and accurately.

Section VII Educational Materials

Refer to the Orange County Stormwater Program (www.ocwatersheds.com) for a library of materials available.

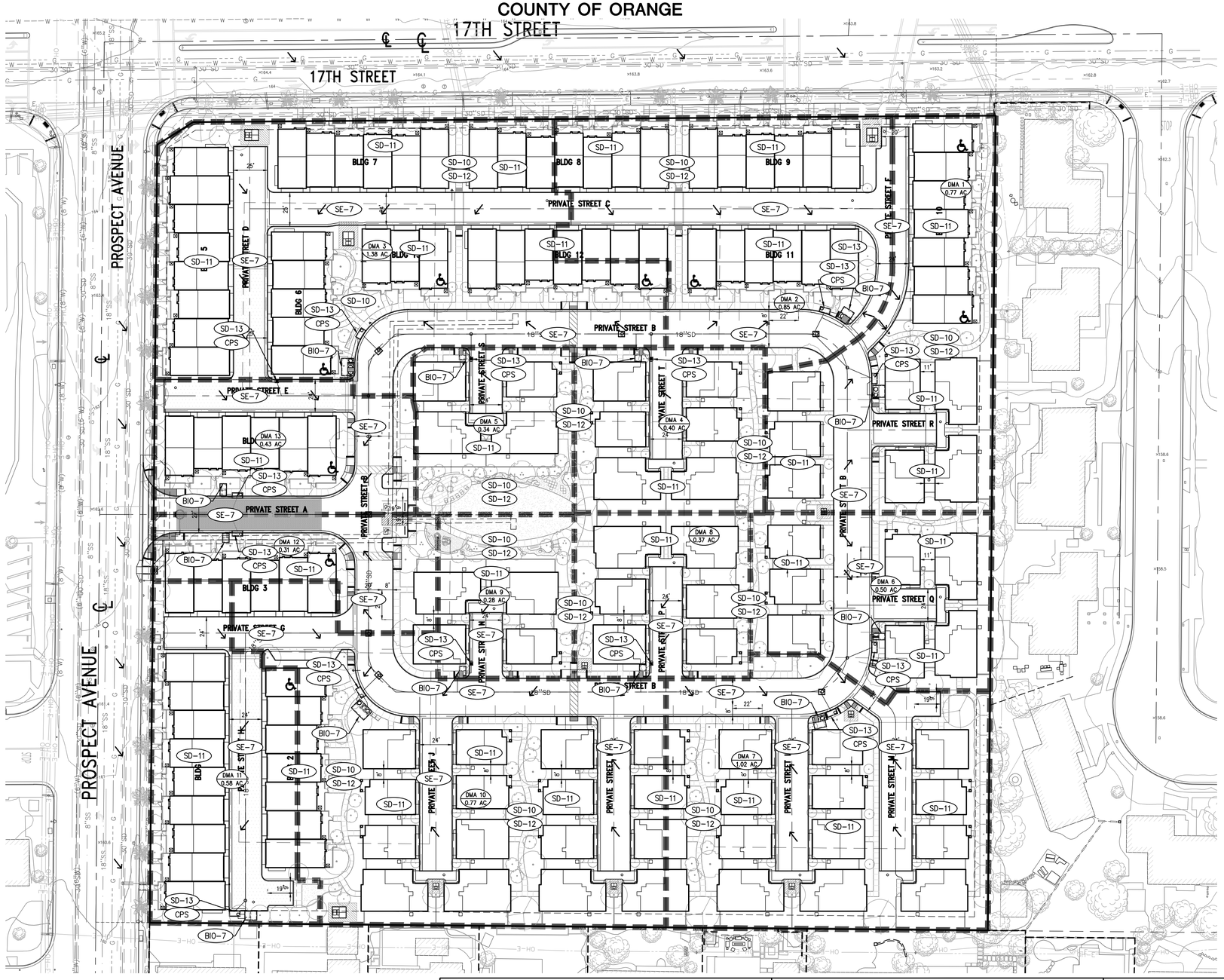
Education Materials			
Residential Material (http://www.ocwatersheds.com)	**Check If Applicable**	**Business Material (http://www.ocwatersheds.com)**	**Check If Applicable**
The Ocean Begins at Your Front Door	☒	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete and Mortar	☐
Tips for the Home Mechanic	☒	Tips for the Food Service Industry	☐
Homeowners Guide for Sustainable Water Use	☒	Proper Maintenance Practices for Your Business	☐
Household Tips	☒	**Other Material**	**Check If Attached**
Proper Disposal of Household Hazardous Waste	☒		
Recycle at Your Local Used Oil Collection Center (North County)	☒		☐
Recycle at Your Local Used Oil Collection Center (Central County)	☐		☐
Recycle at Your Local Used Oil Collection Center (South County)	☐		☐
Tips for Maintaining a Septic Tank System	☐		☐
Responsible Pest Control	☒		☐
Sewer Spill	☒		☐
Tips for the Home Improvement Projects	☒		☐
Tips for Horse Care	☐		☐
Tips for Landscaping and Gardening	☒		☐
Tips for Pet Care	☒		☐
Tips for Pool Maintenance	☐		☐
Tips for Residential Pool, Landscape and Hardscape Drains	☐		☐
Tips for Projects Using Paint	☒		☐

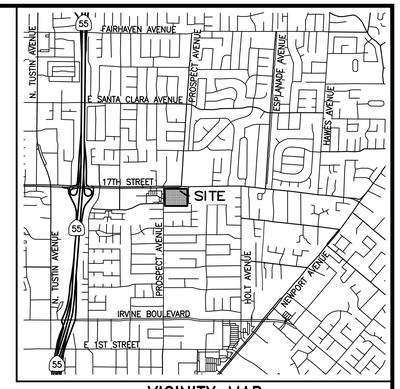
Attachment A

Preliminary WQMP Exhibit

PRELIMINARY WQMP EXHIBIT
FOR TENTATIVE TRACT NO. 19390

PROSPECT AVENUE AND 17TH STREET
CITY OF TUSTIN
COUNTY OF ORANGE





VICINITY MAP
N.T.S

LEGEND

- EXISTING RIGHT-OF-WAY/ BOUNDARY
- PROPOSED RIGHT-OF-WAY/ BOUNDARY
- DRAINAGE MANAGEMENT AREA (DMA)
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN
- DRAINAGE FLOW ARROWS
- PROPOSED CATCH BASIN
- DMA X / X.XX AC — DRAINAGE MANAGEMENT AREA (DMA) / ACREAGE

BEST MANGEMENT PRACTICES (BMPS)

SD-10	SITE DESIGN & LANDSCAPE PLANNING
SD-11	ROOF RUNOFF CONTROLS
SD-12	EFFICIENT IRRIGATION
SD-13	STORM DRAIN SIGNAGE
SE-7	STREET SWEEPING & VACUUMING
BIO-7	MODULAR WETLANDS SYSTEM (MWS), BIOFILTRATION VAULT (SEE PROJECT WQMP FOR ADDITIONAL DETAILS)
CPS	CONNECTOR PIPE SCREEN (CPS) DEVICE

SCALE: 1" = 40'

0 20 40 80

PREPARED FOR:

KINGSBARN CAPITAL & DEVELOPMENT
2500 SAND HILL ROAD, SUITE 320
MENLO PARK, CA, 94025
(650) 782-3300

PREPARED BY:

DANIE P. MCDOUGALL — REGISTERED PROFESSIONAL ENGINEER — C 80705 — CIVIL — STATE OF CALIFORNIA

C&V CONSULTING, INC.
CIVIL ENGINEERING
LAND PLANNING & SURVEYING
9830 IRVINE CENTER DRIVE
IRVINE, CALIFORNIA 92618
(949) 916-3800
INFO@CVC-INC.NET
WWW.CVC-INC.NET

CITY OF TUSTIN
DEPARTMENT OF COMMUNITY DEVELOPMENT

PROJECT NO. KBAR-001

VESTING TENTATIVE TRACT MAP NO. 19390
PRELIMINARY WQMP EXHIBIT
PROSPECT AVE & 17TH STREET
TUSTIN, CALIFORNIA 92780

SHEET 1 OF 1

PLAN SET: P01
DATE: 7/30/2025
P:\KBAR-001\DWG\EXHIBITS\EXH-01-WQMP-01.DWG
BY: JOY HERNANDEZ

Attachment B

TGD Figures & Worksheets

SUBJECT TO FURTHER REVISION

LEGEND

- Orange County Precipitation Stations
- 24 Hour, 85th Percentile Rainfall (Inches)
- 24 Hour, 85th Percentile Rainfall (Inches) - Extrapolated
- City Boundaries

Rainfall Zones

Design Capture Storm Depth (inches)

- 0.65"
- 0.7
- 0.75
- 0.80
- 0.85
- 0.90
- 0.95
- 1.00
- 1.10"

Note: Events defined as 24-hour periods (calendar days) with greater than 0.1 inches of rainfall.
For areas outside of available data coverage, professional judgment shall be applied.

PROJECT SITE

0.65 0.7 0.75 0.8 0.85 0.9 0.95 1 1.05

LOS ANGELES COUNTY
ORANGE COUNTY
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY

0 3 6 12 Kilometers
0 1.8 3.6 7.2 Miles

TITLE: RAINFALL ZONES

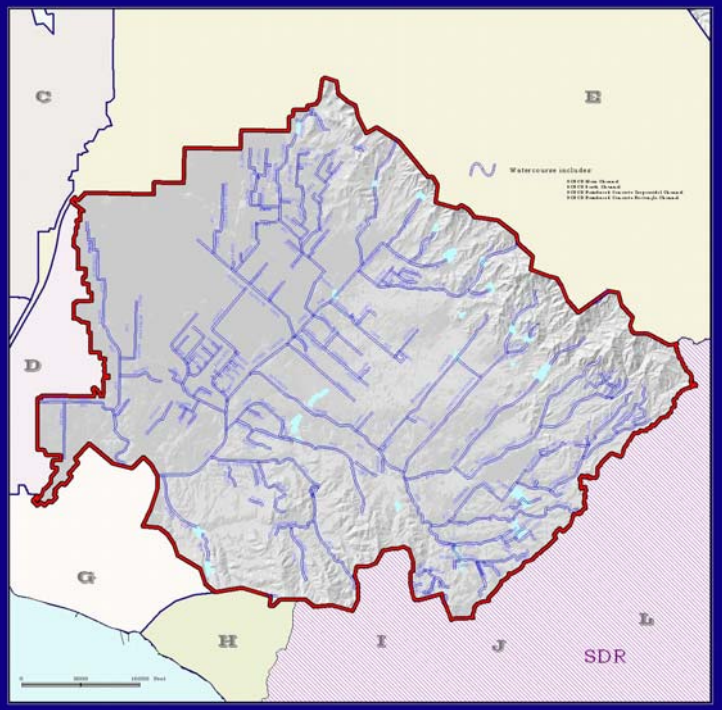
JOB: ORANGE COUNTY TECHNICAL GUIDANCE DOCUMENT — ORANGE CO. CA

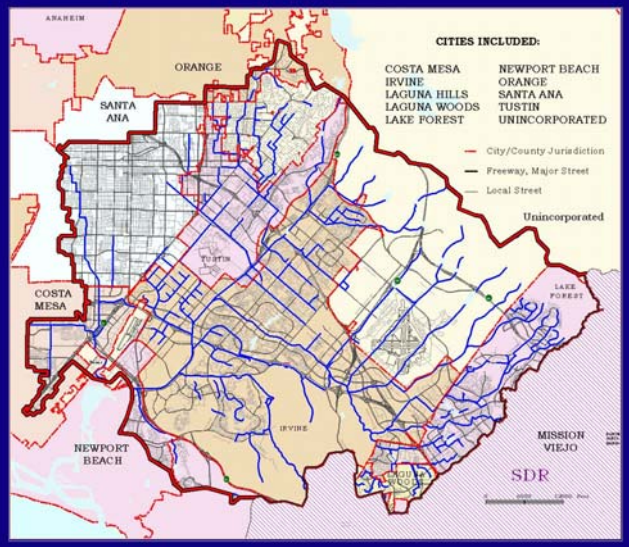
SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

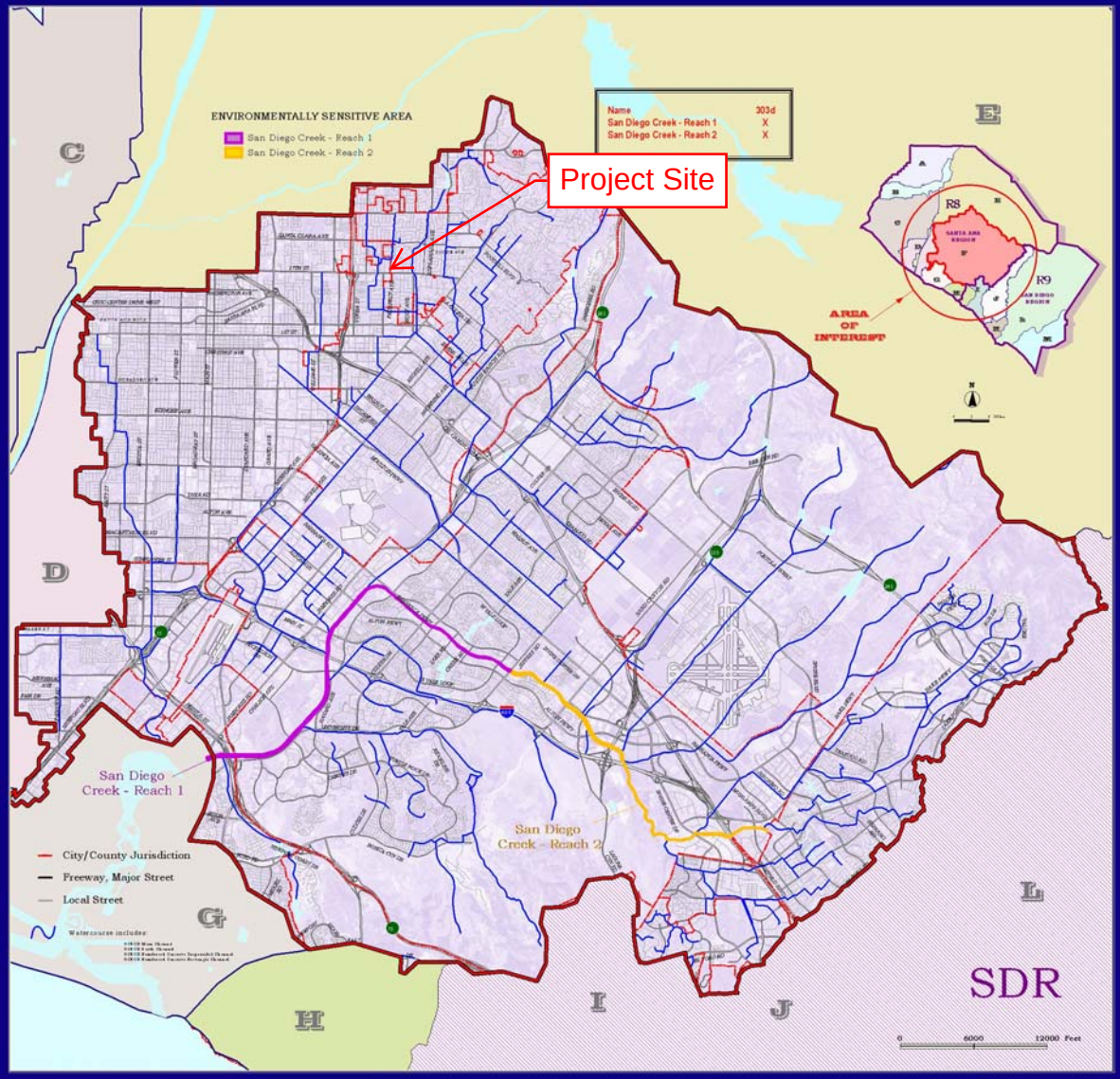
PACE Advanced Water Engineering

FIGURE XVI-1

P:\9526E\16-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-1_RainfallZones_20110215.mxd







WATERSHED F: SAN DIEGO CREEK

ENVIRONMENTALLY SENSITIVE AREAS

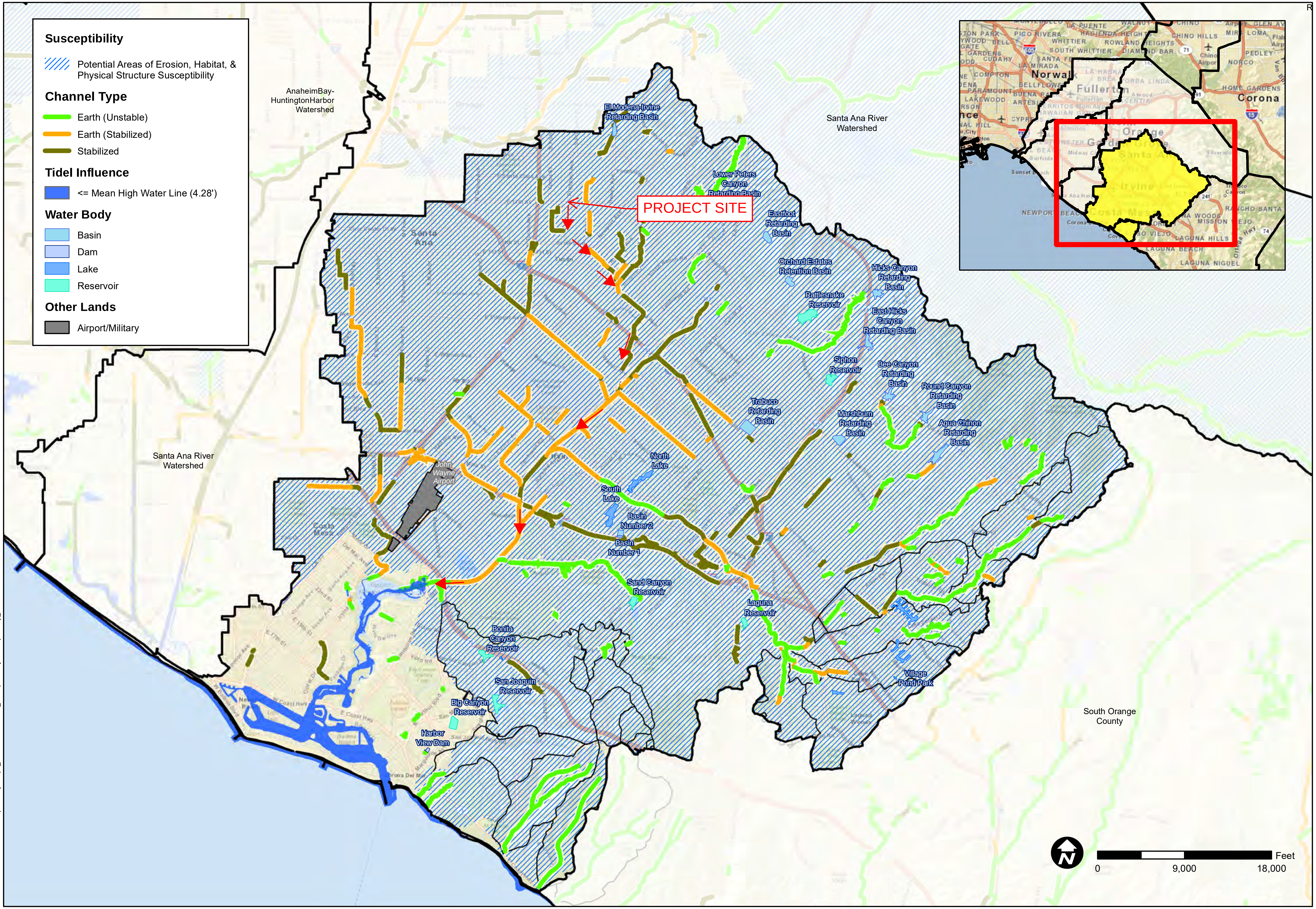
86822 Acres

COUNTY OF ORANGE, CALIFORNIA

DESIGNED AND PRODUCED BY:

DATA SOURCE:

DATE:



TITLE: SUSCEPTIBILITY ANALYIS NEWPORT BAY- NEWPORT COASTAL STREAMS

JOB: ORANGE COUNTY WATERSHED MASTER PLANNING

ORANGE CO. CA

SCALE	DESIGNED	DRAWING	CHECKED	DATE	JOB NO.
1" = 12000'	TH	TH	BMP	04/30/10	9526-E

PACE Advanced Water Engineering

FIGURE 4

P:\9526E\6-GIS\Mxds\SuceptabilityMaps_20100505\9526E_NewportBaySusceptibility_20100430.mxd

SUBJECT TO FURTHER REVISION

LEGEND

- City Boundaries
- OCWD Groundwater Basin Protection Boundary

Plume Protection Boundaries

- North Basin Groundwater Protection Project
- South Basin Groundwater Protection Project
- El Toro Marine Base
- Tustin Marine Air Base
- Approximate Selenium Contamination Area

Note: Individual contamination sites are not plotted.
See State Water Resources Control Board Geotracker database (http://geotracker.waterboards.ca.gov), Department of Toxic Substance Control Envirostor database (http://www.envirostor.dtsc.ca.gov) and other applicable sources for current listing of active contaminated sites.

Groundwater basin and plume protection boundaries for South Orange County are not shown on this exhibit at this time

LOS ANGELES COUNTY
ORANGE COUNTY

SAN BERNARDINO COUNTY
ORANGE COUNTY

RIVERSIDE COUNTY
ORANGE COUNTY

PROJECT SITE

0 2 4 8 Kilometers
0 1.25 2.5 5 Miles

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2f_NorthOCGroundwaterProtectionAreasStreetMap_20110215.mxd

TITLE
NORTH ORANGE COUNTY
GROUNDWATER PROTECTION
AREAS

ORANGE COUNTY
INFILTRATION STUDY

JOB
ORANGE CO.

SCALE	1" = 1.25 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

CA

PACE
Advanced Water Engineering

FIGURE
XVI-2f

SUBJECT TO FURTHER REVISION

LEGEND

- Depth To First Groundwater Contours
- City Boundaries
- OCWD Groundwater Basin Protection Boundary

Note: Data are not available for South Orange County at this time.

Source:
Sprotte, Fuller and Greenwood, 1980.
California Division of Mines and Geology;
California Geological Survey

LOS ANGELES COUNTY
ORANGE COUNTY

SAN BERNARDINO COUNTY
ORANGE COUNTY

RIVERSIDE COUNTY
ORANGE COUNTY

PROJECT SITE
(Refer to project-specific geotechnical report for groundwater levels)

0 2 4 8 Kilometers
0 1.25 2.5 5 Miles

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2d_DepthToGroundwaterOverview_20110215.mxd

TITLE
NORTH ORANGE COUNTY
MAPPED DEPTH TO FIRST
GROUNDWATER

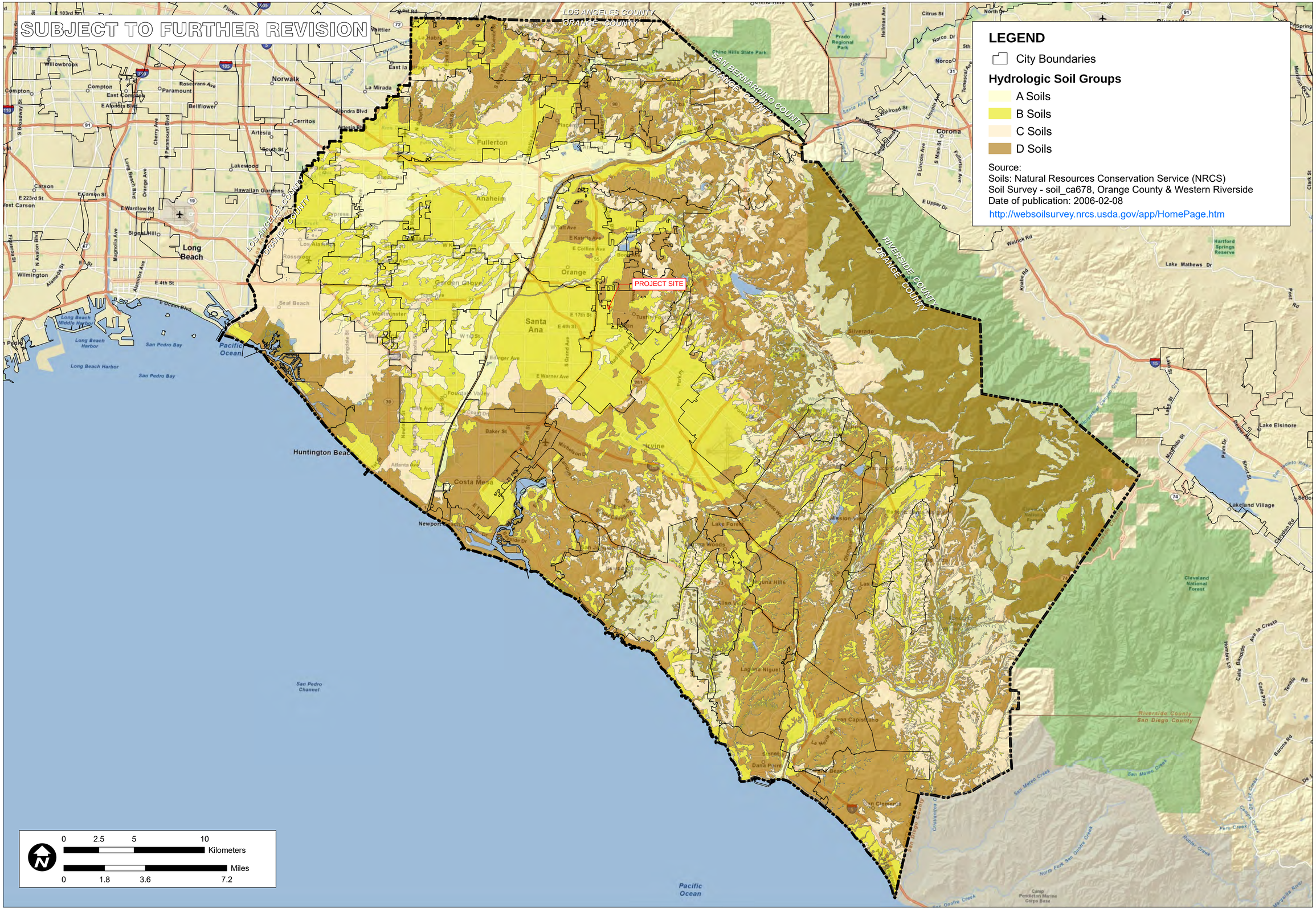
JOB
ORANGE COUNTY
INFILTRATION STUDY
ORANGE CO. CA

SCALE	1" = 1.25 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-2d

SUBJECT TO FURTHER REVISION



LEGEND

City Boundaries

Hydrologic Soil Groups

- A Soils
- B Soils
- C Soils
- D Soils

Source:
Soils: Natural Resources Conservation Service (NRCS)
Soil Survey - soil_ca678, Orange County & Western Riverside
Date of publication: 2006-02-08
http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

0 2.5 5 10 Kilometers

0 1.8 3.6 7.2 Miles

TITLE

NRCS HYDROLOGIC SOILS GROUPS

JOB

ORANGE COUNTY INFILTRATION STUDY

ORANGE CO. CA

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE

XVI-2a

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2a_HydroSoils_20110215.mxd

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.8	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.8	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.771	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.90	
4	Calculate runoff volume, $V_{design}= (C \times d_{remainder} \times A \times 43560 \times (1/12))$	V_{design}=	2,014	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate			**N/A**	
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	NA	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	NA	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	NA	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	NA	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	NA	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	NA	sq-ft

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.8	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.8	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.852	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.90	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	2,228	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate			**N/A**	
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	NA	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	NA	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	NA	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	NA	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	NA	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	NA	sq-ft

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.8	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.8	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	1.38	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.90	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	3,607	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate			**N/A**	
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	NA	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	NA	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	NA	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	NA	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	NA	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	NA	sq-ft

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.8	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.8	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.399	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.90	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	1,042	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate			**N/A**	
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	NA	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	NA	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	NA	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	NA	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	NA	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	NA	sq-ft

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.8	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.8	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.335	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.90	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	876	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate			**N/A**	
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	NA	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	NA	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	NA	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	NA	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	NA	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	NA	sq-ft

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.8	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.8	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.502	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.90	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	1,311	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate			**N/A**	
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	NA	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	NA	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	NA	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	NA	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	NA	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	NA	sq-ft

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.8	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.8	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	1.025	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.90	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	2,678	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate			**N/A**	
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	NA	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	NA	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	NA	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	NA	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	NA	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	NA	sq-ft

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.8	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.8	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.368	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.90	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	961	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate			**N/A**	
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	NA	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	NA	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	NA	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	NA	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	NA	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	NA	sq-ft

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.8	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.8	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.283	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.90	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	739	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate			**N/A**	
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	NA	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	NA	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	NA	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	NA	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	NA	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	NA	sq-ft

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.8	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.8	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	1.311	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.90	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	3,427	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate			**N/A**	
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	NA	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	NA	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	NA	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	NA	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	NA	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	NA	sq-ft

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.8	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.8	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.578	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.90	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	1,512	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate			**N/A**	
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	NA	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	NA	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	NA	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	NA	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	NA	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	NA	sq-ft

Worksheet B: Simple Design Capture Volume Sizing Method

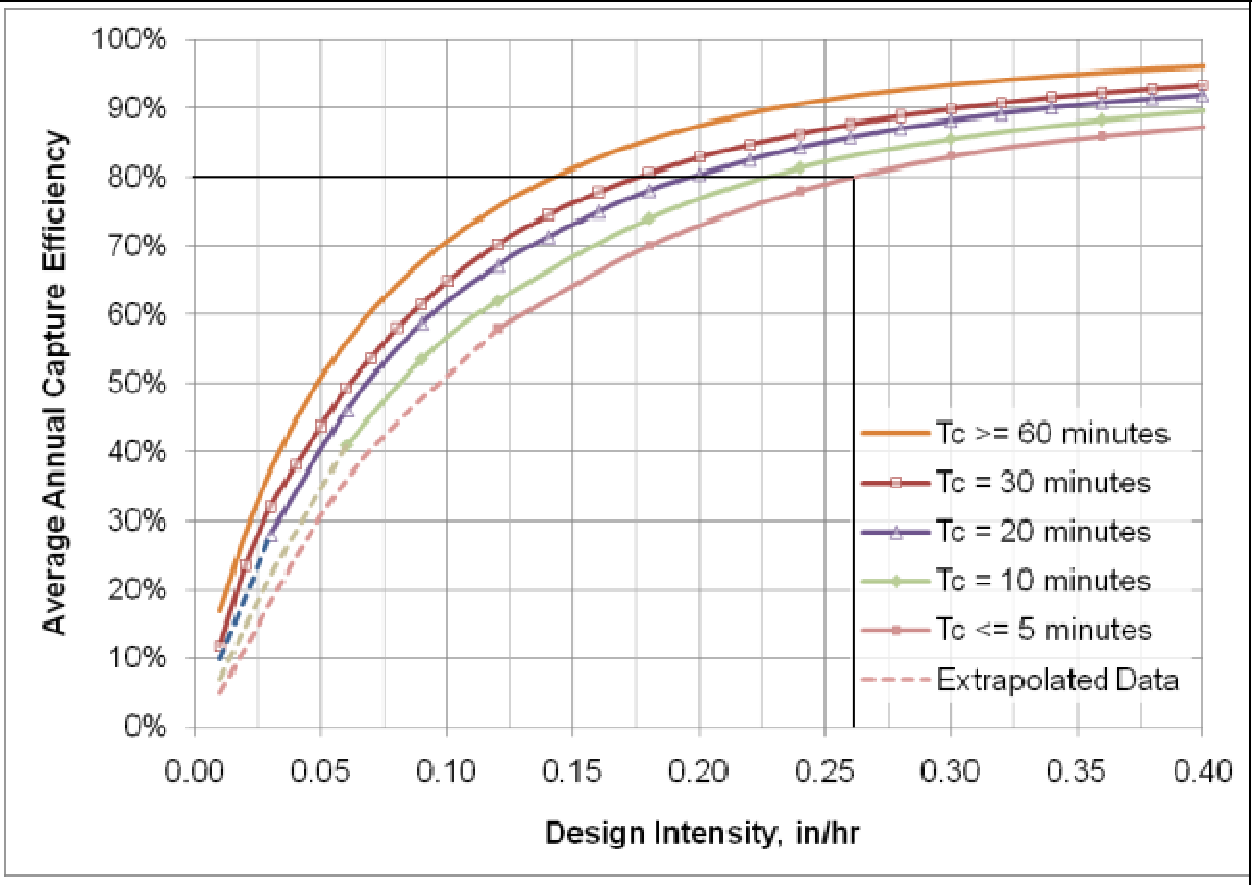
Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.8	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.8	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.305	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.90	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	798	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate			**N/A**	
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	NA	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	NA	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	NA	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	NA	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	NA	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	NA	sq-ft

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.8	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.8	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.432	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.90	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	1,130	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate			**N/A**	
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	NA	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	NA	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	NA	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	NA	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	NA	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	NA	sq-ft

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Graphical Operations



Provide supporting graphical operations. See Example III.7.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	5.00	
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	in/hr
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	I_{design}=	0.26	in/hr
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.77	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00 *	
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.90	
4	Calculate design flowrate, $Q_{design} = (C \times i_{design} \times A)$	Q_{design}=	0.180	cfs

Supporting Calculations

Describe system:
Surface runoff will be conveyed through the private street to proposed curb inlet catch basins equipped with a Dvert System that diverts flows to proposed Biofiltration Vault for water quality treatment.

*Assumed 100% impervious coverage utilized for preliminary calculations. Actual impervious coverage will be calculated in final engineering.

Provide time of concentration assumptions:
The time of concentration was assumed to be 5 minutes for conservative purposes.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	5.00	
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	in/hr
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	I_{design}=	0.26	in/hr
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.85	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00 *	
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.90	
4	Calculate design flowrate, $Q_{design} = (C \times i_{design} \times A)$	Q_{design}=	0.199	cfs

Supporting Calculations

Describe system:
Surface runoff will be conveyed through the private street to proposed curb inlet catch basins equipped with a Dvert System that diverts flows to proposed Biofiltration Vault for water quality treatment.

*Assumed 100% impervious coverage utilized for preliminary calculations. Actual impervious coverage will be calculated in final engineering.

Provide time of concentration assumptions:
The time of concentration was assumed to be 5 minutes for conservative purposes.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	5.00	
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	in/hr
6	Determine the design intensity that must be provided by BMP, $I_{design}= I_1-I_2$	I_{design}=	0.26	in/hr
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	1.38	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00 *	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.90	
4	Calculate design flowrate, $Q_{design}= (C \times i_{design} \times A)$	Q_{design}=	0.323	cfs

Supporting Calculations

Describe system:
Surface runoff will be conveyed through the private street to proposed curb inlet catch basins equipped with a Dvert System that diverts low flows to proposed Biofiltration Vault for water quality treatment.

*Assumed 100% impervious coverage utilized for preliminary calculations. Actual impervious coverage will be calculated in final engineering.

Provide time of concentration assumptions:
The time of concentration was assumed to be 5 minutes for conservative purposes.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	5.00	
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	in/hr
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	I_{design}=	0.26	in/hr
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.40	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00 *	
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.90	
4	Calculate design flowrate, $Q_{design} = (C \times i_{design} \times A)$	Q_{design}=	0.093	cfs

Supporting Calculations

Describe system:
Surface runoff will be conveyed through the private street to proposed curb inlet catch basins equipped with a Dvert System that diverts low flows to proposed Biofiltration Vault for water quality treatment.

*Assumed 100% impervious coverage utilized for preliminary calculations. Actual impervious coverage will be calculated in final engineering.

Provide time of concentration assumptions:
The time of concentration was assumed to be 5 minutes for conservative purposes.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	5.00	
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	in/hr
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	I_{design}=	0.26	in/hr
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.34	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00 *	
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.90	
4	Calculate design flowrate, $Q_{design} = (C \times i_{design} \times A)$	Q_{design}=	0.078	cfs

Supporting Calculations

Describe system:
Surface runoff will be conveyed through the private street to proposed curb inlet catch basins equipped with a Dvert System that diverts low flows to proposed Biofiltration Vault for water quality treatment.

*Assumed 100% impervious coverage utilized for preliminary calculations. Actual impervious coverage will be calculated in final engineering.

Provide time of concentration assumptions:
The time of concentration was assumed to be 5 minutes for conservative purposes.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	5.00	
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	in/hr
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	I_{design}=	0.26	in/hr
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.50	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00 *	
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.90	
4	Calculate design flowrate, $Q_{design} = (C \times i_{design} \times A)$	Q_{design}=	0.117	cfs

Supporting Calculations

Describe system:
Surface runoff will be conveyed through the private street to proposed curb inlet catch basins equipped with a Dvert System that diverts low flows to proposed Biofiltration Vault for water quality treatment.

*Assumed 100% impervious coverage utilized for preliminary calculations. Actual impervious coverage will be calculated in final engineering.

Provide time of concentration assumptions:
The time of concentration was assumed to be 5 minutes for conservative purposes.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	5.00	
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	in/hr
6	Determine the design intensity that must be provided by BMP, $I_{design}= I_1-I_2$	I_{design}=	0.26	in/hr
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	1.02	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00 *	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.90	
4	Calculate design flowrate, $Q_{design}= (C \times i_{design} \times A)$	Q_{design}=	0.240	cfs

Supporting Calculations

Describe system:
Surface runoff will be conveyed through the private street to proposed curb inlet catch basins equipped with a Dvert System that diverts low flows to proposed Biofiltration Vault for water quality treatment.

*Assumed 100% impervious coverage utilized for preliminary calculations. Actual impervious coverage will be calculated in final engineering.

Provide time of concentration assumptions:
The time of concentration was assumed to be 5 minutes for conservative purposes.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	5.00	
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	in/hr
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	I_{design}=	0.26	in/hr
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.37	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00 *	
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.90	
4	Calculate design flowrate, $Q_{design} = (C \times i_{design} \times A)$	Q_{design}=	0.086	cfs

Supporting Calculations

Describe system:
Surface runoff will be conveyed through the private street to proposed curb inlet catch basins equipped with a Dvert System that diverts low flows to proposed Biofiltration Vault for water quality treatment.

*Assumed 100% impervious coverage utilized for preliminary calculations. Actual impervious coverage will be calculated in final engineering.

Provide time of concentration assumptions:
The time of concentration was assumed to be 5 minutes for conservative purposes.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	5.00	
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	in/hr
6	Determine the design intensity that must be provided by BMP, $I_{design}= I_1-I_2$	I_{design}=	0.26	in/hr
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.28	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00 *	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.90	
4	Calculate design flowrate, $Q_{design}= (C \times i_{design} \times A)$	Q_{design}=	0.066	cfs

Supporting Calculations

Describe system:
Surface runoff will be conveyed through the private street to proposed curb inlet catch basins equipped with a Dvert System that diverts low flows to proposed Biofiltration Vault for water quality treatment.

*Assumed 100% impervious coverage utilized for preliminary calculations. Actual impervious coverage will be calculated in final engineering.

Provide time of concentration assumptions:
The time of concentration was assumed to be 5 minutes for conservative purposes.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	5.00	
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	in/hr
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	I_{design}=	0.26	in/hr
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	1.31	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00 *	
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.90	
4	Calculate design flowrate, $Q_{design} = (C \times i_{design} \times A)$	Q_{design}=	0.307	cfs

Supporting Calculations

Describe system:
Surface runoff will be conveyed through the private street to proposed curb inlet catch basins equipped with a Dvert System that diverts low flows to proposed Biofiltration Vault for water quality treatment.

*Assumed 100% impervious coverage utilized for preliminary calculations. Actual impervious coverage will be calculated in final engineering.

Provide time of concentration assumptions:
The time of concentration was assumed to be 5 minutes for conservative purposes.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	5.00	
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	in/hr
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	I_{design}=	0.26	in/hr
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.58	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00 *	
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.90	
4	Calculate design flowrate, $Q_{design} = (C \times i_{design} \times A)$	Q_{design}=	0.135	cfs

Supporting Calculations

Describe system:
Surface runoff will be conveyed through the private street to proposed curb inlet catch basins equipped with a Dvert System that diverts low flows to proposed Biofiltration Vault for water quality treatment.

*Assumed 100% impervious coverage utilized for preliminary calculations. Actual impervious coverage will be calculated in final engineering.

Provide time of concentration assumptions:
The time of concentration was assumed to be 5 minutes for conservative purposes.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	5.00	
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	in/hr
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	I_{design}=	0.26	in/hr
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.31	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00 *	
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.90	
4	Calculate design flowrate, $Q_{design} = (C \times i_{design} \times A)$	Q_{design}=	0.071	cfs

Supporting Calculations

Describe system:
Surface runoff will be conveyed through the private street to proposed curb inlet catch basins equipped with a Dvert System that diverts low flows to proposed Biofiltration Vault for water quality treatment.

*Assumed 100% impervious coverage utilized for preliminary calculations. Actual impervious coverage will be calculated in final engineering.

Provide time of concentration assumptions:
The time of concentration was assumed to be 5 minutes for conservative purposes.

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	5.00	
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	in/hr
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	I_{design}=	0.26	in/hr
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.43	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.00 *	
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.90	
4	Calculate design flowrate, $Q_{design} = (C \times i_{design} \times A)$	Q_{design}=	0.101	cfs

Supporting Calculations

Describe system:
Surface runoff will be conveyed through the private street to proposed curb inlet catch basins equipped with a Dvert System that diverts low flows to proposed Biofiltration Vault for water quality treatment.

*Assumed 100% impervious coverage utilized for preliminary calculations. Actual impervious coverage will be calculated in final engineering.

Provide time of concentration assumptions:
The time of concentration was assumed to be 5 minutes for conservative purposes.

Worksheet I: Summary of Groundwater-related Feasibility Criteria

1	Is project large or small? (as defined by Table VIII.2) circle one	Large	**Small**	
2	What is the tributary area to the BMP?	A	8.54	acres
3	What type of BMP is proposed?	Biofiltration		
4	What is the infiltrating surface area of the proposed BMP?	A_{BMP}	0	sq-ft
5	What land use activities are present in the tributary area (list all) Multi-Family Residential			
6	What land use-based risk category is applicable?	L	**M**	H
7	If M or H, what pretreatment and source isolation BMPs have been considered and are proposed (describe all): Proposed MWS System Biofiltration Vaults will provide treatment for the required design flow rate.			
8	What minimum separation to mounded seasonally high groundwater applies to the proposed BMP? See Section VIII.2 (circle one)	5 ft	**10 ft**	
9	Provide rationale for selection of applicable minimum separation to seasonally high mounded groundwater: Per the TGD Section VIII.2, the following applies to a subsurface infiltration gallery: "Separation to mounded seasonally high groundwater shall be at least 10 feet for infiltration devices that inject water below the subsurface and surface infiltration BMPs with tributary area and land use activities that are considered to pose a more significant risk to groundwater quality."			
10	What is separation from the infiltrating surface to seasonally high groundwater?	SHGWT	5	ft
11	What is separation from the infiltrating surface to mounded seasonally high groundwater?	Mounded SHGWT	n/a	ft
12	Describe assumptions and methods used for mounding analysis:			
13	Is the site within a plume protection boundary (See Figure	Y	**N**	N/A

Worksheet I: Summary of Groundwater-related Feasibility Criteria

	VIII.2)?	
14	Is the site within a selenium source area or other natural plume area (See Figure VIII.2)?	Y **N** N/A
15	Is the site within 250 feet of a contaminated site?	Y **N** N/A
16	If site-specific study has been prepared, provide citation and briefly summarize relevant findings: n/a	
17	Is the site within 100 feet of a water supply well, spring, septic system?	Y **N** N/A
18	Is infiltration feasible on the site relative to groundwater-related criteria?	Y **N**
Provide rationale for feasibility determination: The site is within the shallow groundwater boundary per North Orange County Mapped Shallow Groundwater Figure XVI-2d		

Note: if a single criterion or group of criteria would render infiltration infeasible, it is not necessary to evaluate every question in this worksheet.

Worksheet J: Summary of Harvested Water Demand and Feasibility **Entire Site**

1	What demands for harvested water exist in the tributary area (check all that apply):			
2	Toilet and urinal flushing		□	
3	Landscape irrigation		✓	
4	Other:_____		□	
5	What is the design capture storm depth? (Figure III.1)	d	0.80	inches
6	What is the project size?	A	8.54	ac
7	What is the acreage of impervious area?	* IA	7.26	ac
	For projects with multiple types of demand (toilet flushing, irrigation demand, and/or other demand)			
8	What is the minimum use required for partial capture? (Table X.6)			gpd
9	What is the project estimated wet season total daily use (Section X.2)?			gpd
10	Is partial capture potentially feasible? (Line 9 > Line 8?)			
	For projects with only toilet flushing demand			
11	What is the minimum TUTIA for partial capture? (Table X.7)			
12	What is the project estimated TUTIA?			
13	Is partial capture potentially feasible? (Line 12 > Line 11?)			
	For projects with only irrigation demand			
14	What is the minimum irrigation area required based on conservation landscape design? (Table X.8) [1.59x1.01]	1.29		ac
15	What is the proposed project irrigated area? (multiply conservation landscaping by 1; multiply active turf by 2)	1.28		ac
16	Is partial capture potentially feasible? (Line 15 > Line 14?)	No		

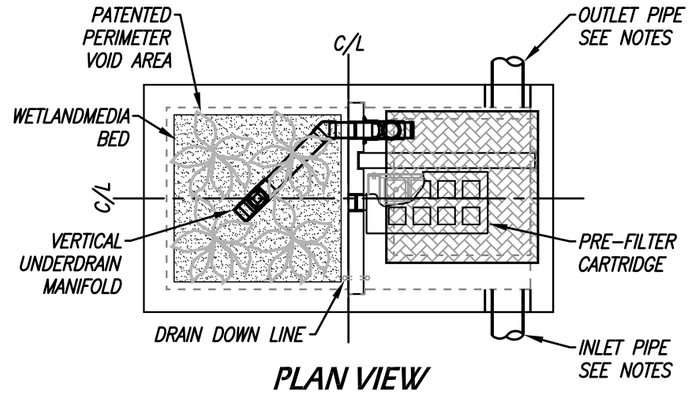
Provide supporting assumptions and citations for controlling demand calculation:
Due to the proposed development type, density and amount of available landscaping, Harvest and Use BMPs for irrigation purposes will not be feasible.

* For preliminary purposes, an assumed 85% impervious coverage based on development type was utilized for these calculations.

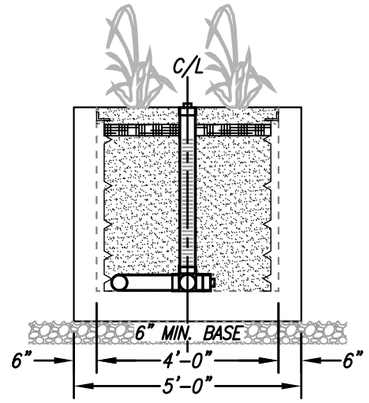
Attachment C

Site BMPs

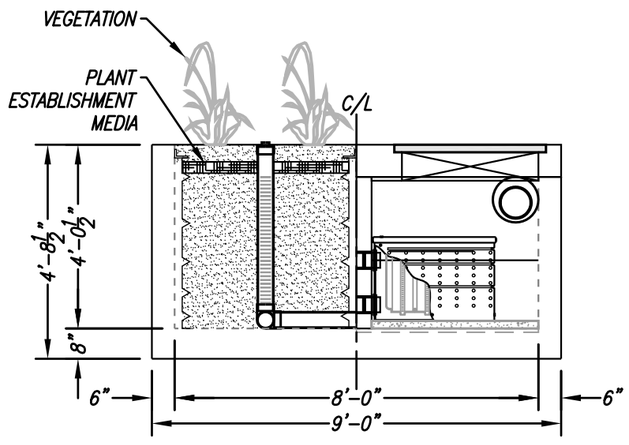
SITE SPECIFIC DATA			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PARKWAY	OPEN PLANTER	PARKWAY
FRAME & COVER	36" X 36"	N/A	N/A
WETLANDMEDIA VOLUME (CY)			2.03
WETLANDMEDIA DELIVERY METHOD			TBD
ORIFICE SIZE (DIA. INCHES)			ø1.53"
MAXIMUM PICK WEIGHT (LBS)			15000
NOTES:			



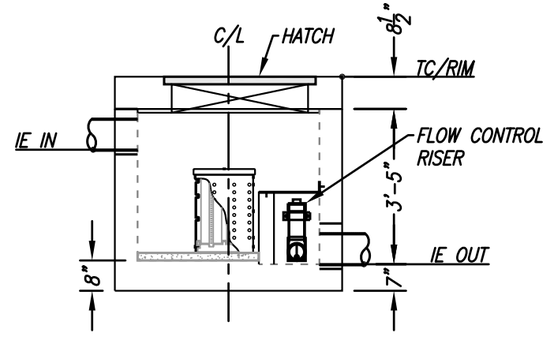
PLAN VIEW



LEFT END VIEW
BIOFILTRATION



ELEVATION VIEW



RIGHT END VIEW
PRETREATMENT/DISCHARGE

INSTALLATION NOTES

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TREATMENT FLOW (CFS)	0.115
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	TBD
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

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MWS-L-4-8-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

SITE SPECIFIC DATA*	
PROJECT NAME	
PROJECT LOCATION	
STRUCTURE ID	

PERFORMANCE DATA	
TREATMENT FLOW (CFS)	
TREATMENT HGL (FT)	
BYPASS FLOW RATE (CFS)	DEPENDANT ON PIPE SIZE

PROJECT PARAMETERS			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1		PVC	
OUTLET PIPE		PVC	
RIM ELEVATION			
SURFACE LOADING REQUIREMENT			PARKWAY

FRAME & COVER	PRETREATMENT	BIOFILTRATION	DISCHARGE
	30"	OPEN PLANTER	12"

WETLANDMEDIA VOLUME (CY)	
MEDIA DELIVERED	TBD
ORIFICE SIZE (DIA)	
MAX PICK WEIGHT (LBS)	TBD

NOTES:

*PER ENGINEER OF RECORD

INSTALLATION NOTES

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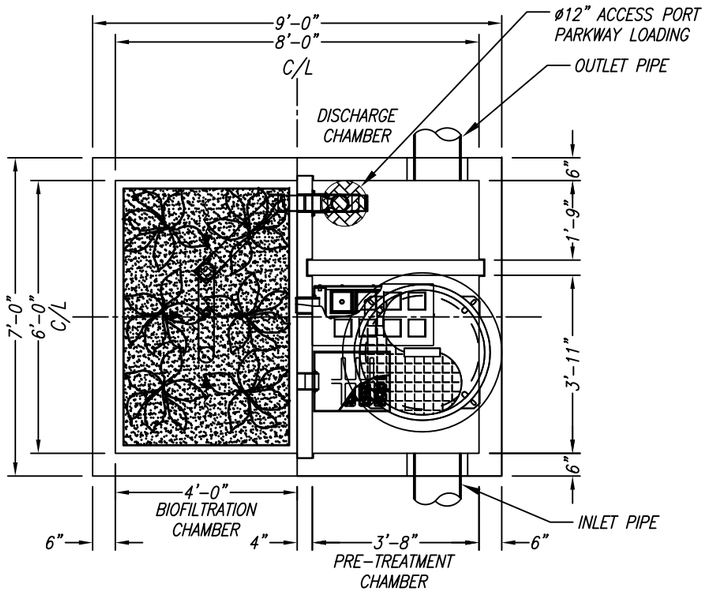
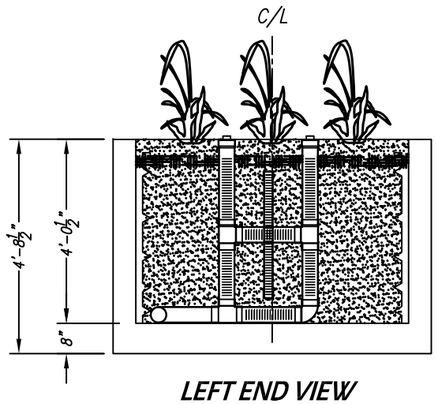
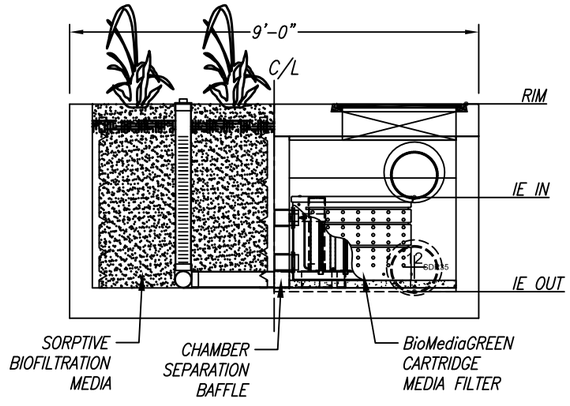


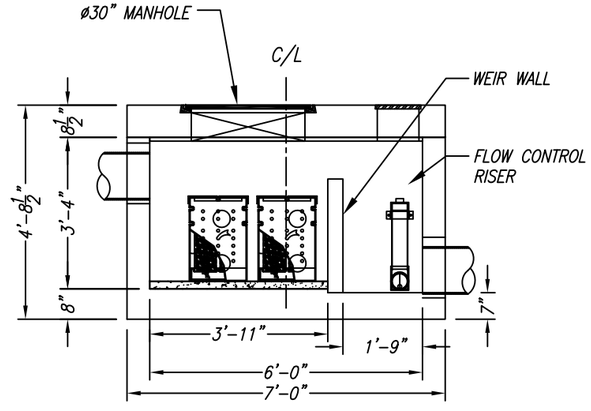
PLAN VIEW



LEFT END VIEW
BIOFILTRATION CHAMBER



ELEVATION VIEW



RIGHT END VIEW
PRETREATMENT/DISCHARGE CHAMBER

TREATMENT CAPACITY (CFS)	0.147
OPERATING HEAD (FT)	3.40
PRE-FILTER LOADING RATE (GPM/SF)	2.07
WETLAND LOADING RATE (GPM/SF)	1.03

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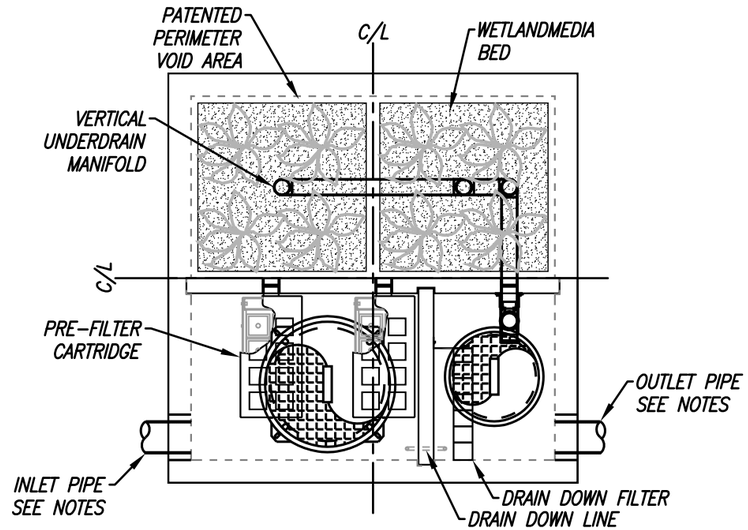
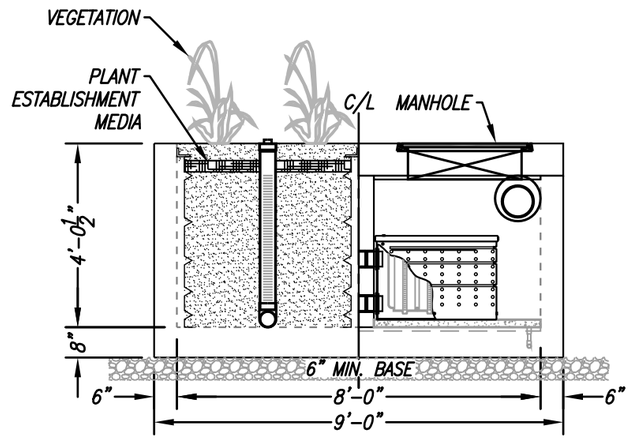
MWS-L-6-8-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

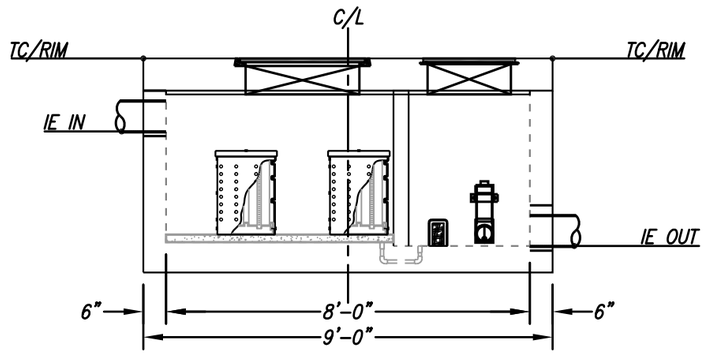
SITE SPECIFIC DATA			
PROJECT NAME		KATELLA AVENUE PROJECT	
PROJECT LOCATION		5701 KATELLA AVENUE, CYPRESS	
STRUCTURE ID		TBD	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.156	
TREATMENT HGL AVAILABLE (FT)			TBD
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			N/A
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	TBD	TBD	TBD
INLET PIPE 2	TBD	TBD	TBD
OUTLET PIPE	TBD	TBD	TBD
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	TBD	TBD	TBD
SURFACE LOAD	PARKWAY	OPEN PLANTER	PARKWAY
FRAME & COVER	ø30"	N/A	ø24"
WETLANDMEDIA VOLUME (CY)			4.84
WETLANDMEDIA DELIVERY METHOD			TBD
ORIFICE SIZE (DIA. INCHES)			ø2.16"
MAXIMUM PICK WEIGHT (LBS)			TBD
NOTES:			



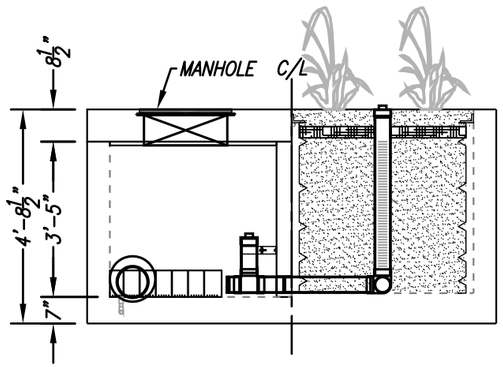
PLAN VIEW



LEFT END VIEW
BIOFILTRATION/PRETREATMENT



ELEVATION VIEW



RIGHT END VIEW
DISCHARGE/BIOFILTRATION

INSTALLATION NOTES

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TREATMENT FLOW (CFS)	0.230
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	TBD
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

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MWS-L-8-8-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

SITE SPECIFIC DATA*	
PROJECT NAME	
PROJECT LOCATION	
STRUCTURE ID	

PERFORMANCE DATA	
TREATMENT VOLUME (CF)	
DRAINDOWN TIME (HR)	
TREATMENT HGL (FT)	
BYPASS FLOW RATE (CFS)	

PROJECT PARAMETERS			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
OUTLET PIPE 1			
RIM ELEVATION			
SURFACE LOADING REQUIREMENT			

FRAME & COVER	PRETREATMENT	BIOFILTRATION	DISCHARGE

WETLANDMEDIA VOLUME (CY)	
MEDIA DELIVERED	
ORIFICE SIZE (DIA)	
MAX PICK WEIGHT (LBS)	

NOTES:

*PER ENGINEER OF RECORD

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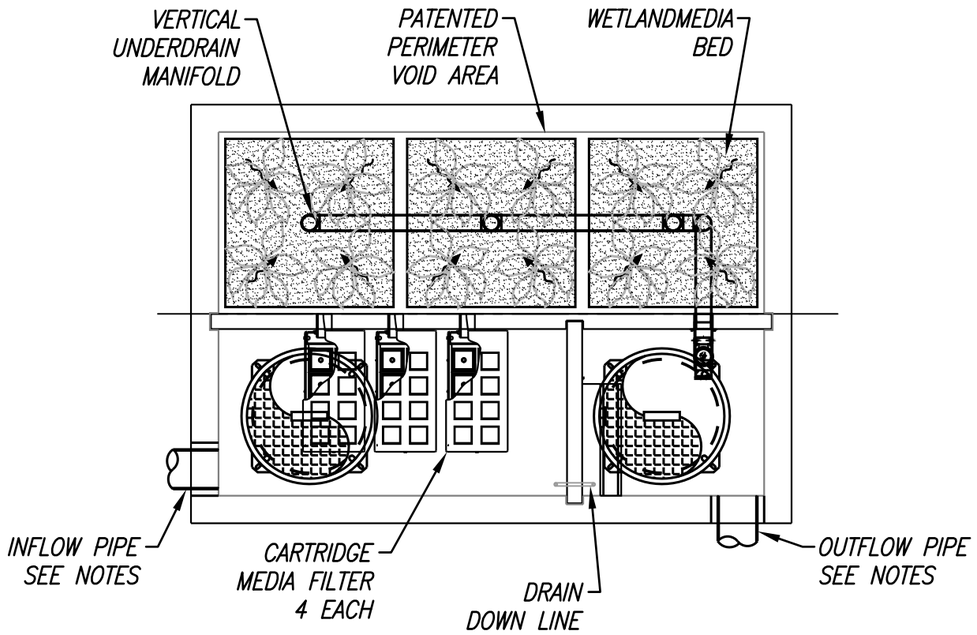
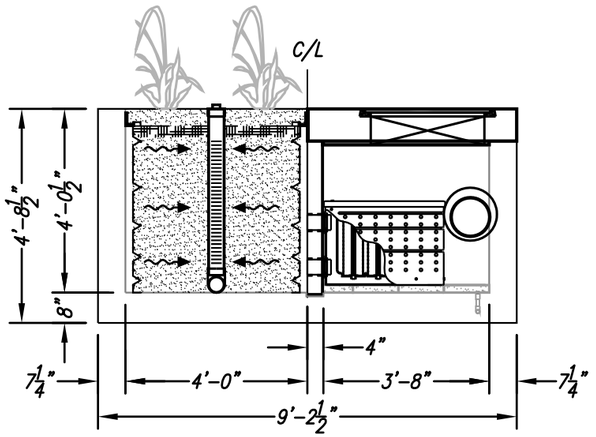
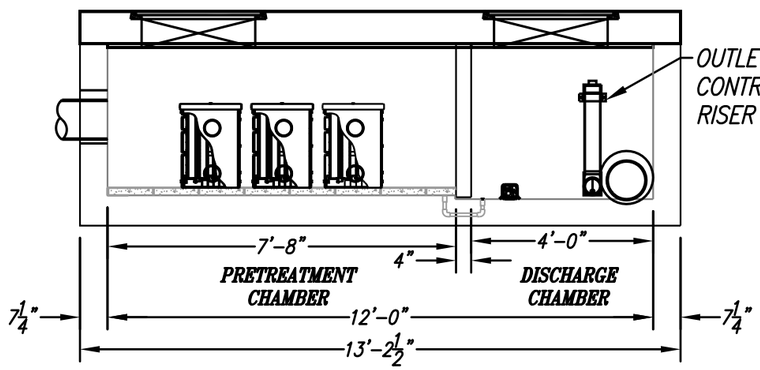


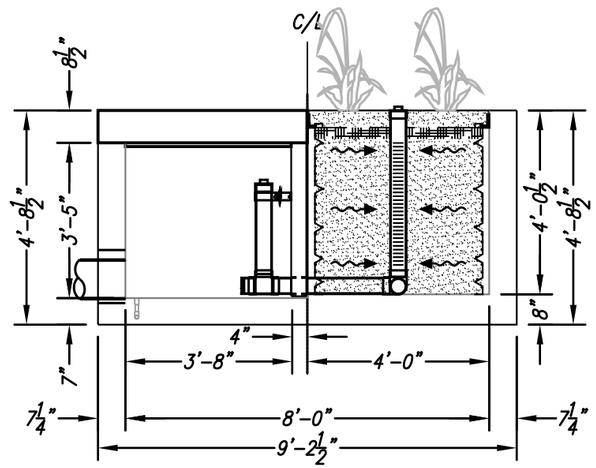
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

MWS UNIT DESIGN DATA	
TREATMENT CAPACITY (CFS)	0.346
OPERATING HEAD (FT)	3.4
PRETREATMENT SURFACE AREA (SF)	105.84
WETLAND LOADING RATE (GPM/MIN)	1.04

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MODULAR WETLANDS

MWS-L-8-12-V

STORMWATER BIOFILTRATION SYSTEM STANDARD DETAIL

Bio Clean
A Forterra Company

Section [_____]
Stormwater Connector Pipe Screen

PART 1 – GENERAL

01.01.00 Purpose
The purpose of this specification is to establish generally acceptable criteria for Connector Pipe Screens used for collecting trash and debris inside catch basins. It is intended to serve as a guide to producers, distributors, architects, engineers, contractors, plumbers, installers, inspectors, agencies and users; to promote understanding regarding materials, manufacture and installation; and to provide for identification of devices complying with this specification.

01.02.00 Description
Stormwater Connector Pipe Screens (CPS) are used to prevent trash and debris from entering the stormwater system during dry weather and moderate storm flows by keeping the trash inside the catch basin. The CPS is a screen placed permanently or temporarily in a catch basin at the location of the outlet pipe. The screen separates trash and debris from stormwater treatment flows. Flows that exceed the treatment flow rate bypass over the top of the screen. When the outlet pipe is located below a curb opening the CPS features a lid to prevent debris from passing behind the screen and flowing directly to the outlet pipe. The CPS shall be designed to retain all trash larger than 5 mm (0.197 inches) in the catch basin.

01.03.00 Manufacturer
The manufacturer of the CPS shall be one that is regularly engaged in the engineering, design and production of systems developed for the treatment of stormwater runoff for at least (10) years, and which has a history of successful production, acceptable to the engineer of work. In accordance with the drawings, the CPS(s) shall be a screen device manufactured/distributed by Bio Clean Environmental Services, Inc., or assigned distributors or licensees. Bio Clean Environmental Services, Inc. can be reached at:

5796 Armada Drive, Suite 250
Carlsbad, CA 92008
Phone: (760) 433-7640
Fax: (760) 433-3176
www.biocleanenvironmental.net

01.04.00 Submittals

01.04.01 Submittal drawings will be provided with each order to the contractor and engineer of work.

01.04.02 Submittal drawings are to detail the CPS, its components and the sequence for installation, including:

- CPS configuration with primary dimensions
- Various CPS components
- Any accessory equipment

01.04.03 Inspection and maintenance documentation submitted upon request.

01.05.00 Work Included

01.05.01 Specification requirements for installation of CPS.

01.05.02 Manufacturer to supply CPS(s):

- Screen
- Mounting hardware
- Bypass lid with supports (when required)

PART 2 – COMPONENTS

02.01.01 The CPS shall have a sufficient structural integrity to withstand a lateral force of standing water within the catch basin area when the screen becomes 100% clogged. The CPS unit shall be bolted to the catch basin walls.

02.01.02 The CPS shall be configured with deflector plates or screens preventing trash from falling between the screen and connector pipe. The deflector plate shall be designed to withstand a vertical load.

02.01.03 The gap at the bottom, sides, and joints of the CPS unit shall not exceed 5 mm (0.197 inches).

02.01.04 The CPS shall include vertical structural stiffeners extending the full length of the screen in the form as bends in the screen itself, a bolting surface to fasten the CPS to the wall of the catch basin, and support for the upper portion of the CPS unit referred to as the "bypass."

02.01.05 All parts/components of the CPS unit must be sized to fit through the catch basin's manhole opening.

02.01.06 The CPS frame shall be fabricated from 304 stainless steel.

02.01.07 The CPS screen shall be fabricated from perforated 304 stainless steel. The screen shall have a minimum thickness of 16 gauge. The geometrical opening shape shall have a diameter of 5 mm (0.197 inches).

02.01.08 The screen material used shall have at least 45% open area.

02.01.09 Any edge of the CPS that is not flush with the wall or floor of the catch basin shall be smooth with no prongs or jagged edges.

02.01.10 The assembly bolts, screws, nuts, and washers shall be fabricated entirely from 316 stainless steel. The concrete anchor bolts shall use a wedge anchor, with Type 316 stainless steel threaded rods, nuts, and washers.

PART 3 – PERFORMANCE

03.01.00 General

03.01.01 Function - The CPS has no moving internal components and functions based on gravity flow, unless otherwise specified. Stormwater runoff enters the catch basin through a curb opening and flows toward the connector pipe. The CPS is placed to intercept flows prior to exiting the catch basin through the connector pipe. The CPS must be able to be removed through the catch basin opening. Stormwater flow up to the peak treatment rate is processed through the screen. Flows in excess of the peak treatment rate will overtop the screen in a bypass. The lid (when required) shall be place high enough above the screen to allow for full bypass flow.

03.01.02 Pollutants - The CPS will remove and retain trash and debris larger than 5 mm in diameter entering the catch basin during frequent storm events and specified flow rates.

03.01.03 Treatment Flow Rate - The CPS operates through gravity flow. The CPS is to be sized so the screen is capable of passing the calculated project specific water quality flow rate per local standards. All treatment flow rates must include a 50% screen clogging factor.

03.01.04 Bypass Flow Rate – The CPS is designed to fit within the catch basin in a way not to affect the existing hydraulics and treat or bypass all flows. The bypass must be sized with a surface area greater than the outlet pipe size, thus the CPS shall not be a critical point of flow restriction.

PART 4 - EXECUTION

04.01.00 General

The installation and use of the CPS shall conform to all applicable national, state, municipal and local specifications.

04.02.00 Installation

The contractor shall furnish all labor, equipment, materials and incidentals required to install the CPS device(s) and appurtenances in accordance with the drawings, installation manual, and these specifications, and be inspected and approved by the local governing agency. Any damage to catch basin and surrounding infrastructure caused by the installation of the CPS is the responsibility of the installation contractor.

04.02.01 CPS and all components or accessories shall be inserted through the catch basin and properly secured per manufactures installation manual and these specifications.

04.03.00 Shipping, Storage and Handling

04.03.01 Shipping – CPS shall be shipped to the contractor's address and is the responsibility of the contractor to transport the unit(s) to the exact site of installation.

04.03.02 Storage and Handling– The contractor shall exercise care in the storage and handling of the CPS(s) and its components prior to and during installation. Any repair or replacement costs associated with events occurring after delivery is accepted, and unloading has commenced shall be born by the contractor. The CPS(s) and its components shall always be stored indoors and transported inside the original shipping container(s) until the CPS(s) are ready to be installed. The CPS shall always be handled with care and lifted according to OSHA and NIOSA lifting recommendations and/or contractor's workplace safety professional recommendations.

04.04.00 Maintenance and Inspection

04.04.01 Inspection – After installation, the contractor shall demonstrate that the CPS has been properly installed at the correct location(s), elevations, and with appropriate supports and fasteners. All components associated with the CPS and its installation shall be subject to inspection by the engineer of work, governing agency, and the manufacture at the place of installation. In addition, the contractor shall demonstrate that the CPS has been installed per the manufacturer's specifications and recommendations. CPS(s) shall be physically inspected regularly in accordance to owner's Stormwater Pollution Prevention Plans (SWPPP) and manufacture's recommendations. An inspection record shall be kept by the inspection operator. The record shall include the condition of the CPS and its appurtenances. The most current copy of the inspection record shall always be copied and placed in the owner's SWPPP.

04.04.02 Maintenance – The maintenance shall be performed by someone qualified. A Maintenance Manual is available upon request from the manufacturer. The

manual has detailed information regarding the maintenance of the CPS(s). A detailed Maintenance Record shall be kept by the maintenance operator. The Maintenance Record shall include any maintenance activities preformed, amount and description of debris collected, and the condition of the CPS. The most current copy of the Maintenance Record shall always be copied and placed in the owner's Stormwater Pollution Prevention Plan (SWPPP) per governing agency. Upon cleaning: no trash or debris shall be located in the catch basin, on top of the bypass lid, or between the screen; no vegetation shall block the catch basin opening or connector pipe; and no trash or debris shall be located within the catch basin opening.

04.04.03 Material Disposal - All debris, trash, organics, and sediments captured and removed from the CPS shall be transported and disposed of at an approved facility for disposal in accordance with local and state regulations. Please refer to state and local regulations for the proper disposal of toxic and non-toxic material.

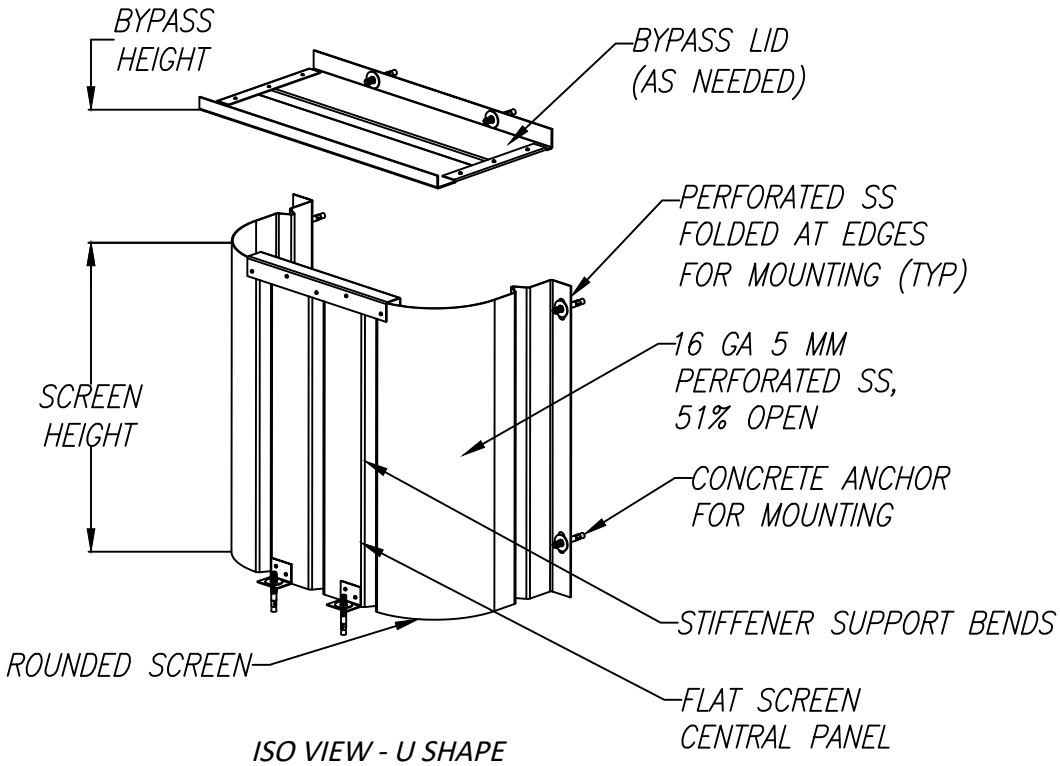
PART 5 – QUALITY ASSURANCE

05.01.00 Warranty

The manufacturer shall guarantee the CPS against all manufacturing defects in materials and workmanship for a period of (3) years from the date of delivery to the contractor. The manufacturer shall be notified of repair or replacement issues in writing within the warranty period. The CPS is limited to recommended application for which it was designed.

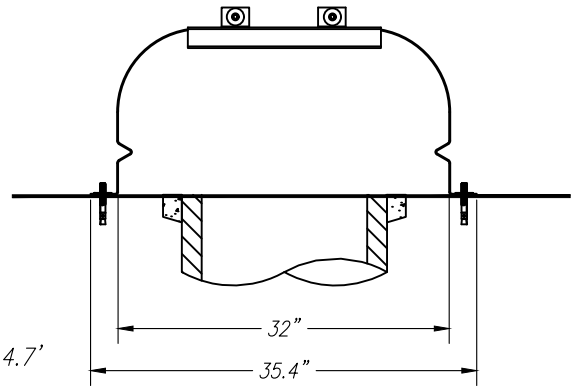
[End of This Section]

CONNECTOR PIPE SCREEN (CPS)
U 4.7



ISO VIEW - U SHAPE

CPS U WITH 4.7 FT SCREEN LENGTH	
CPS HEIGHT (IN)	SCREEN FLOW (CFS)
12	6.67
18	12.26
24	18.88
30	26.40
36	34.71
NOTE: BYPASS FLOW RATES VARY WITH VAULT DEPTH AND BYPASS HEIGHT. CONTACT BIO CLEAN FOR ADDITIONAL INFORMATION.	



TOTAL SCREEN LENGTH ~ 4.7'
SPAN LENGTH = 32"
COMPATIBLE WITH PIPES UP TO Ø24"

TOP SECTION VIEW - U SHAPE

GENERAL NOTES

1. BIO CLEAN TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE.
3. THIS CPS UNIT IS DESIGNED FOR TREATMENT FLOWS THROUGH THE SCREEN. FLOWS GREATER THAN THE TREATMENT FLOW RATE WILL BYPASS OVER THE SCREEN.
4. A BYPASS LID IS REQUIRED WHEN THE OUTLET PIPE IS DIRECTLY BELOW THE CURB OPENING.
5. CPS IS COMPRISED OF 304 STAINLESS STEEL. THICKNESS IS 16 GAUGE. SCREEN PERFORATIONS ARE 5 MILLIMETERS IN DIAMETER. THE SCREEN AREA IS 51% OPEN SPACE.

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS, AND INCIDENTALS REQUIRED TO INSTALL THE CPS UNIT AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. POSITION THE CPS SO IT IS EVENLY SPACED AROUND THE CONNECTOR PIPE, ENSURING A MIN. OF 4" SPACING AWAY FROM ANY CORNERS. SCREEN BOTTOM SHALL BE FLUSH WITH THE CATCH BASIN FLOOR, OR WITH GAPS NO GREATER THAN 5 MM.
3. IF A BYPASS LID IS REQUIRED, VERIFY THE BYPASS HEIGHT NEEDED AND MARK THAT LOCATION ON THE WALL DIRECTLY ABOVE THE BASE UPRIGHTS. LIFT THE LID IN PLACE AND MARK THE HOLE LOCATIONS FOR THE LID MOUNTING BRACKETS. SECURE THE LID WITH STAINLESS STEEL NUTS.

WARRANTY: 3 YEAR MANUFACTURER'S		MEETS FULL CAPTURE REQUIREMENTS	
BIO CLEAN ENVIRONMENTAL SERVICES, INC. 398 VIA EL CENTRO, OCEANSIDE CA 92058 PHONE: 760-433-7640		REVISIONS:	DATE:
		REVISIONS:	DATE:
DATE: 1/17/2020	SCALE: NTS	REVISIONS:	DATE:
DRAFTER: G.M.S.	UNITS = INCHES	REVISIONS:	DATE:

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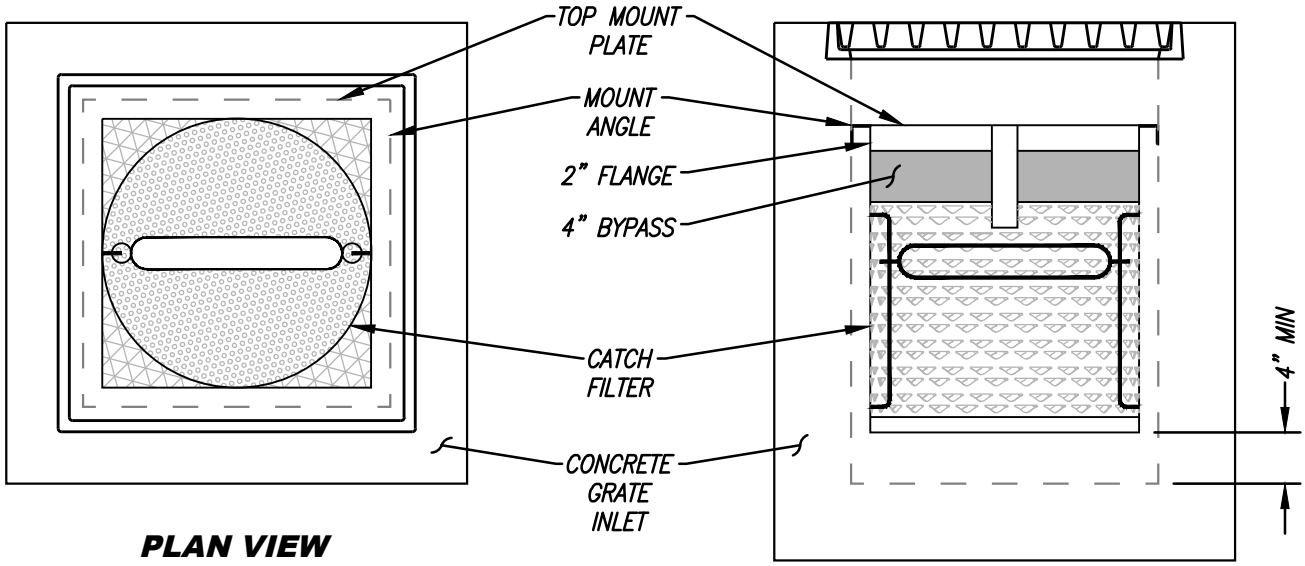
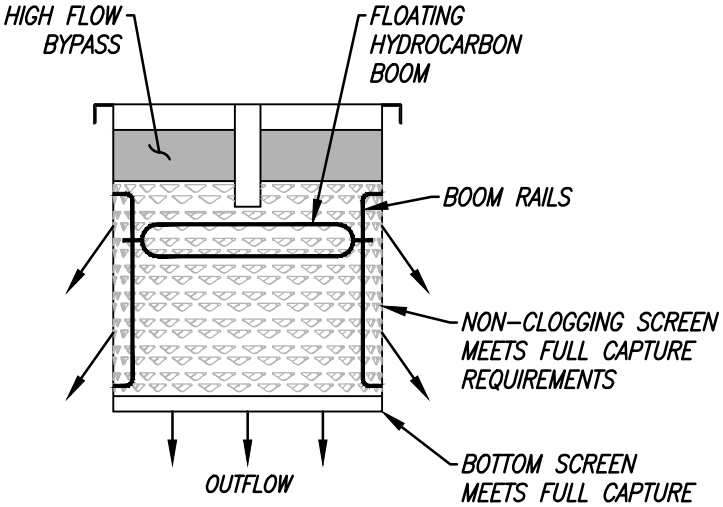


PLAN VIEW
(GRATE NOT SHOWN)

ELEVATION VIEW



FLOW DIAGRAM

MODEL #	TREATMENT FLOW RATE (CFS)	BYPASS FLOW (CFS)	SOLIDS STORAGE CAPACITY (CF)
BIO-GRATE-KMF 12-12-12	0.97	1.55	0.14
BIO-GRATE-KMF 18-18-12	1.86	3.68	0.35
BIO-GRATE-KMF 26-26-12	2.78	4.83	0.60
BIO-GRATE-KMF 24-40-12	6.71	6.59	1.04
BIO-GRATE-KMF 26-26-24	9.49	4.83	1.80
BIO-GRATE-KMF 24-40-24	13.53	6.59	3.12
BIO-GRATE-KMF 36-36-24	17.14	7.60	4.45

INSTALLATION NOTES:

1. ALL HARDWARE, FLANGE, FRAME, SCREENS SHALL BE STAINLESS STEEL.
2. HYDROCARBON BOOM SHALL BE 2" DIAMETER AND CONNECTED, MECHANICALLY TO THE FILTER FRAME WITH RAILS ALLOWING IT TO FLOAT ON THE WATER SURFACE REGARDLESS OF HEIGHT.
3. SEE PERFORMANCE REPORTS IN MANUFACTURES SPECIFICATIONS.
4. OTHER STANDARD AND CUSTOM MODEL SIZES AVAILABLE – CONTACT BIO CLEAN FOR MORE INFORMATION.
5. BASED ON 37% OPEN AREA.
6. CONSIDERS A SAFETY FACTOR OF 2.0.
7. CONSIDERS A LOCAL DEPRESSION PONDIING DEPTH OF 6 INCHES..
8. STORAGE CAPACITY BASED ON THE BASKET HALF FULL.
9. CONCRETE STRUCTURES SOLD SEPARATELY.

1:15 SCALE

PROPRIETARY AND CONFIDENTIAL:

THE INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF FORTERRA AND ITS COMPANIES. THIS DOCUMENT, NOR ANY PART THEREOF, MAY BE USED, REPRODUCED OR MODIFIED IN ANY MANNER WITH OUT THE WRITTEN CONSENT OF FORTERRA.

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GRATE INLET FILTER
FULL CAPTURE
STANDARD DETAIL

8/27/21GIRARDT

Site Design & Landscape Planning SD-10

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- ☑ Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

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Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.

- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.

- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.

- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.

- Promote natural vegetation by using parking lot islands and other landscaped areas.

- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.

- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and

regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Roof Runoff Controls SD-11

Rain Garden

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Description

Various roof runoff controls are available to address stormwater that drains off rooftops. The objective is to reduce the total volume and rate of runoff from individual lots, and retain the pollutants on site that may be picked up from roofing materials and atmospheric deposition. Roof runoff controls consist of directing the roof runoff away from paved areas and mitigating flow to the storm drain system through one of several general approaches: cisterns or rain barrels; dry wells or infiltration trenches; pop-up emitters, and foundation planting. The first three approaches require the roof runoff to be contained in a gutter and downspout system. Foundation planting provides a vegetated strip under the drip line of the roof.

Approach

Design of individual lots for single-family homes as well as lots for higher density residential and commercial structures should consider site design provisions for containing and infiltrating roof runoff or directing roof runoff to vegetative swales or buffer areas. Retained water can be reused for watering gardens, lawns, and trees. Benefits to the environment include reduced demand for potable water used for irrigation, improved stormwater quality, increased groundwater recharge, decreased runoff volume and peak flows, and decreased flooding potential.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

One method of addressing roof runoff is to direct roof downspouts to cisterns or rain barrels. A cistern is an above ground storage vessel with either a manually operated valve or a permanently open outlet. Roof runoff is temporarily stored and then released for irrigation or infiltration between storms. The number of rain

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barrels needed is a function of the rooftop area. Some low impact developers recommend that every house have at least 2 rain barrels, with a minimum storage capacity of 1000 liters. Roof barrels serve several purposes including mitigating the first flush from the roof which has a high volume, amount of contaminants, and thermal load. Several types of rain barrels are commercially available. Consideration must be given to selecting rain barrels that are vector proof and childproof. In addition, some barrels are designed with a bypass valve that filters out grit and other contaminants and routes overflow to a soak-away pit or rain garden.

If the cistern has an operable valve, the valve can be closed to store stormwater for irrigation or infiltration between storms. This system requires continual monitoring by the resident or grounds crews, but provides greater flexibility in water storage and metering. If a cistern is provided with an operable valve and water is stored inside for long periods, the cistern must be covered to prevent mosquitoes from breeding.

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say ¼ to ½ inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

Roof downspouts can be directed to dry wells or infiltration trenches. A dry well is constructed by excavating a hole in the ground and filling it with an open graded aggregate, and allowing the water to fill the dry well and infiltrate after the storm event. An underground connection from the downspout conveys water into the dry well, allowing it to be stored in the voids. To minimize sedimentation from lateral soil movement, the sides and top of the stone storage matrix can be wrapped in a permeable filter fabric, though the bottom may remain open. A perforated observation pipe can be inserted vertically into the dry well to allow for inspection and maintenance.

In practice, dry wells receiving runoff from single roof downspouts have been successful over long periods because they contain very little sediment. They must be sized according to the amount of rooftop runoff received, but are typically 4 to 5 feet square, and 2 to 3 feet deep, with a minimum of 1-foot soil cover over the top (maximum depth of 10 feet).

To protect the foundation, dry wells must be set away from the building at least 10 feet. They must be installed in solids that accommodate infiltration. In poorly drained soils, dry wells have very limited feasibility.

Infiltration trenches function in a similar manner and would be particularly effective for larger roof areas. An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. These are described under Treatment Controls.

Pop-up Drainage Emitter

Roof downspouts can be directed to an underground pipe that daylights some distance from the building foundation, releasing the roof runoff through a pop-up emitter. Similar to a pop-up irrigation head, the emitter only opens when there is flow from the roof. The emitter remains flush to the ground during dry periods, for ease of lawn or landscape maintenance.

Foundation Planting

Landscape planting can be provided around the base to allow increased opportunities for stormwater infiltration and protect the soil from erosion caused by concentrated sheet flow coming off the roof. Foundation plantings can reduce the physical impact of water on the soil and provide a subsurface matrix of roots that encourage infiltration. These plantings must be sturdy enough to tolerate the heavy runoff sheet flows, and periodic soil saturation.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Supplemental Information

Examples

- City of Ottawa's Water Links Surface –Water Quality Protection Program
- City of Toronto Downspout Disconnection Program
- City of Boston, MA, Rain Barrel Demonstration Program

Other Resources

Hager, Marty Catherine, Stormwater, "Low-Impact Development", January/February 2003. www.stormh2o.com

Low Impact Urban Design Tools, Low Impact Development Design Center, Beltsville, MD. www.lid-stormwater.net

Start at the Source, Bay Area Stormwater Management Agencies Association, 1999 Edition

Efficient Irrigation SD-12

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

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- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Storm Drain Signage SD-13

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ☑ Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING

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– DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.

- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Street Sweeping and Vacuuming SE-7

Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.

If User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.
- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd^3 hopper) to $88/hour (9 yd^3 hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

Attachment D

O&M Plan

Operations and Maintenance (O&M) Plan

Water Quality Management Plan
For

Tract 19390
Tustin, CA

APNs: 401-401-12, 401-401-13, 401-401-14, 401-401-15, 401-401-16, 401-401-17

Legal Description:

THE LAND REFERRED TO HEREIN IS SITUATED IN THE STATE OF CALIFORNIA, COUNTY OF ORANGE, CITY OF TUSTIN AND DESCRIBED AS FOLLOWS: LOTS 1 TO 5 INCLUSIVE AND LOT A, OF TRACT NO. 17342, IN THE CITY OF TUSTIN COUNTY OF ORANGE, STATE OF CALIFORNIA, AS PER MAP RECORDED NOVEMBER 4, 2011 IN BOOK 906, PAGES 44 TO 47 INCLUSIVE OF MAPS IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

Attachment D, Operations and Maintenance Plan

BMP Applicable? Yes/ No	BMP Name and BMP Implementation, Maintenance, and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation and Maintenance Responsibility
Non-Structural Source Control BMPs			
Yes	**N1. Education for Property Owners, Tenants, and Occupants** This will be addressed through educational materials. All included materials provide ways of mitigating stormwater pollution in everyday activities associated with residents as well as employees of the property management company and their sub-contractors. Practical informational materials are provided to residents, occupants, or tenants to increase the public's understanding of stormwater quality, sources of pollutants, and what they can do to reduce pollutants in stormwater.	HOA/ OWNER to provide educational materials, a copy of the approved WQMP and Operation & Maintenance Plan (O&M) to new property owners, tenants, occupants & employees, at time of hire, leasing and/ or home purchase.	HOA/ OWNER
Yes	**N2. Activity Restriction** Rules or guidelines for developments are established within the appropriate documents which prohibit activities that can result in discharges of pollutants.	HOA/ OWNER employees notified of activities that are prohibited by homeowners.	Restrictions identified in Employee Manual and reviewed yearly by employees.
Yes	**N3. Common Area Landscape Management** Specific practices are followed, and ongoing maintenance is conducted to minimize erosion and over-irrigation, conserve water, and reduce pesticide and fertilizer applications.	Professional landscape company to conduct maintenance of landscaping to meet current water efficiency and keep plants healthy and bio areas maintained with proper soil amendments. Regular maintenance once a week and monthly inspection to determine deficiencies	The HOA/ OWNER will maintain or hire professionals to manage the upkeep of the project's landscaped areas.
Yes	**N4. BMP Maintenance** In order to ensure adequate and comprehensive BMP implementation, all responsible parties are identified for implementing all non-structural and structural BMPs, cleaning, inspection, and other maintenance activities are specified including responsible parties for conducting such activities.	A minimum 2 Inspections/ Cleanings per year per manufacturer's specifications prior to October 1st (before the rainy season)	HOA/ OWNER to hire professional BMP maintenance company to conduct regular inspections, repairs, and cleaning per manufacturer's specifications.
Yes	**N5. Title 22 CCR Compliance** Hazardous waste is managed properly through compliance with applicable Title 22 regulations. Hazardous materials or wastes will be generated, handled, transported, or disposed of in association with the project; measures are taken to comply with	At time of hiring, leasing and/ or home purchase.	The distribution of these materials will be the responsibility of the HOA at the time of hire, lease signing or home purchase per property owner, tenant,

	applicable local, state, and federal regulation to avoid harm to humans and the environment.		or occupant or at the initial time of hiring.
No	**N7. Spill Contingency Plan**		
No	**N8. Underground Storage Tank Compliance**		
Yes	**N10. Uniform Fire Code Implementation** HOA/ OWNER to comply with fire regulations and keep informed of the latest rules and requirements.	Comply with annual fire inspections and maintain building and access per the latest fire codes.	HOA/ OWNER
Yes	**N11. Common Area Litter Control** The proposed project will have various trash receptacles located near the common areas. Trash management and litter control procedures are specified within this report, including responsible parties, and implemented to reduce pollution of drainage water.	Once per week provide litter removal of site parking lot and landscape areas and to empty common area trash bins.	HOA/ OWNER
Yes	**N12. Employee Training** Practical informational materials and/or training are provided to employees at the initial time of hiring by the HOA/ OWNER to increase their understanding of stormwater quality, sources of pollutants, and their responsibility for reducing pollutants in stormwater.	The distribution of these materials will be the responsibility of the HOA/ OWNER at the initial hiring of the employee.	HOA/ OWNER
No	**N13. Housekeeping of Loading Docks**		
Yes	**N14. Common Area Catch Basin Inspection** In order to ensure adequate and comprehensive BMP implementation, all responsible parties are identified for implementing all non-structural and structural BMPs, cleaning, inspection, and other maintenance activities are specified including responsible parties for conducting such activities.	Inspection twice per month of common areas where catch basins are located within the surrounding area and remove any trash/ debris.	HOA/ OWNER
Yes	**N15. Street Sweeping Private Streets and Parking Lots** Regular sweeping is conducted to reduce pollution of drainage water.	City's Street Sweeping Services or approved Private Company on a weekly basis	HOA/ OWNER
No	**N17. Retail Gasoline Outlets**		
Structural Source Control BMPs			

Yes	**S1. Provide Storm Drain System Stenciling and Signage** Catch Basin Stenciling and Signage will be placed on all on-site catch basins to the satisfaction of the City Engineer.	Inspect and repair as needed all onsite storm drain stencilling & signage. Inspection should occur at minimum twice per year.	HOA/ OWNER
No	**S2. Design and Construct Outdoor Material Storage Areas to Reduce Pollutant Introduction**		
No	**S3. Design and Construct Trash and Waste Storage Areas to Reduce Pollutant Introduction (trash enclosures)**		
Yes	**S4. Use Efficient Irrigation Systems and Landscape Design** Site efficient irrigation and landscaping has been implemented by the project's landscape architect to the satisfaction of the City Engineer and Planning Department.	HOA/ OWNER to provide maintenance of landscaping to meet current water efficiency standards and keep plants healthily. Regular maintenance once a week and monthly inspection to determine any water deficiencies.	The HOA/ OWNER will maintain or hire professionals to manage the upkeep of the project's landscaped areas.
Yes	**S5. Protect Slopes and Channels** In order to ensure proper function of stormwater facilities and reduce pollution of drainage water.	HOA/ Owner to inspect drainage channels and remove and trash/debris. Inspection/cleaning should occur at least twice per year	HOA/ OWNER
No	**S6. Loading Docks Areas**		
No	**S7. Maintenance Bays and Docks**		
No	**S8. Vehicle Wash Areas**		
No	**S9. Outdoor Processing Areas**		
No	**S10. Equipment Wash Areas**		
No	**S11. Fueling Areas**		
No	**S12. Site Design and Landscape Planning**		
No	**S13. Wash Water Controls for Food Preparation Area**		
No	**S14. Community Car Wash Racks**		
Low Impact Development BMPs			
Yes	**Treatment Control BMP #1** **Connector Pipe Screen (CPS) Device** See attached for specific BMP detailed information pertaining to operation and maintenance.	Inspections/ Cleanings should occur at least two times per year and before the start of the rainy season (October 1st). Refer to manufacturer's specifications for additional information.	HOA/ OWNER will be required to hire a professional maintenance company to provide regular inspection, repairs, and cleaning per manufacturer's specifications. All trash/ debris and loose sediment/ silt shall be removed per manufacturer's specifications.

Yes	**Treatment Control BMP** **Modular Wetlands System Biofiltration Vault & Dvert System** See attached for specific BMP detailed information pertaining to operation and maintenance.	Inspections/ Cleanings should occur at least two times per year and before the start of the rainy season (October 1st). Refer to manufacturer's specifications for additional information.	HOA/ OWNER will be required to hire a professional maintenance company to provide regular inspection, repairs, and cleaning per manufacturer's specifications. All trash/ debris and loose sediment/ silt shall be removed per manufacturer' specifications.

Required Permits

This section must list any permits required for the implementation, operation, and maintenance of the BMPs. Possible examples are:

- No required permits are needed for the implementation, operation, and maintenance of the previously listed BMPs.

Forms to Record the BMP Implementation, Maintenance, and Inspection

The form that will be used to record the implementation, maintenance, and inspection of the BMPs is attached.

Recordkeeping

All records must be maintained for at least five (5) years and must be made available for review upon request.

Notice to Owner:

The property is currently owned by KB Home. The Owner will be responsible for the long-term maintenance of the project's storm water facilities and conformance to this WQMP after construction is complete.

The owner is aware of the maintenance responsibilities of the proposed BMPs. A funding mechanism is in place to maintain the BMPs at the frequency stated in the WQMP.

RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

Today's Date: _____

Name of Person Performing Activity: _____
(Printed)

Signature: _____

BMP Name (As Shown on O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

Operation & Maintenance Plan - Attachments

- Modular Wetlands System, Maintenance Guidelines
- Connector Pipe Screen (CPS), Operation & Maintenance Manual

BioMediaGREEN

Modular Wetland System (MWS) – LINEAR

Maintenance Cost (per acre)

MWS - LINEAR	Cleaning Required	Yearly Maintenance Cost
Year 1	1) Clean Inlet Filter (6 Month Intervals) 2) Vacuum Catch Basin (12 Month Intervals) 3) Replace BioMedia Green Filter Media	$80 / each (x2) $350 / year $500 / year
Year 2	1) Clean Inlet Filter (6 Month Intervals) 2) Vacuum Catch Basin (12 Month Intervals) 3) Replace BioMedia Green Filter Media	$80 / each (x2) $350 / year $500 / year
Year 3	1) Clean Inlet Filter (6 Month Intervals) 2) Vacuum Catch Basin (12 Month Intervals) 3) Replace BioMedia Green Filter Media	$80 / each (x2) $350 / year $500 / year
Year 4	1) Clean Inlet Filter (6 Month Intervals) 2) Vacuum Catch Basin (12 Month Intervals) 3) Replace BioMedia Green Filter Media	$80 / each (x2) $350 / year $500 / year
Year 5	1) Clean Inlet Filter (6 Month Intervals) 2) Vacuum Catch Basin (12 Month Intervals) 3) Replace BioMedia Green Filter Media	$80 / each (x2) $350 / year $500 / year
Year 6	1) Clean Inlet Filter (6 Month Intervals) 2) Vacuum Catch Basin (12 Month Intervals) 3) Replace BioMedia Green Filter Media	$80 / each (x2) $350 / year $500 / year
Year 7	1) Clean Inlet Filter (6 Month Intervals) 2) Vacuum Catch Basin (12 Month Intervals) 3) Replace BioMedia Green Filter Media	$80 / each (x2) $350 / year $500 / year
Year 8	1) Clean Inlet Filter (6 Month Intervals) 2) Vacuum Catch Basin (12 Month Intervals) 3) Replace BioMedia Green Filter Media	$80 / each (x2) $350 / year $500 / year
Year 9	1) Clean Inlet Filter (6 Month Intervals) 2) Vacuum Catch Basin (12 Month Intervals) 3) Replace BioMedia Green Filter Media	$80 / each (x2) $350 / year $500 / year
Year 10	1) Clean Inlet Filter (6 Month Intervals) 2) Vacuum Catch Basin (12 Month Intervals) 3) Replace BioMedia Green Filter Media 4) Remove & Replace Wetland Plants & Media	$80 / each (x2) $350/ year $500 / year $2,500
Total 1 - 10	**Total Maintenance Cost Over 10 Years**	**$11,800**
Average Yearly Cost	**Assumes 10 Year Replacement of Wetland Media.**	**$1,180 / Year**

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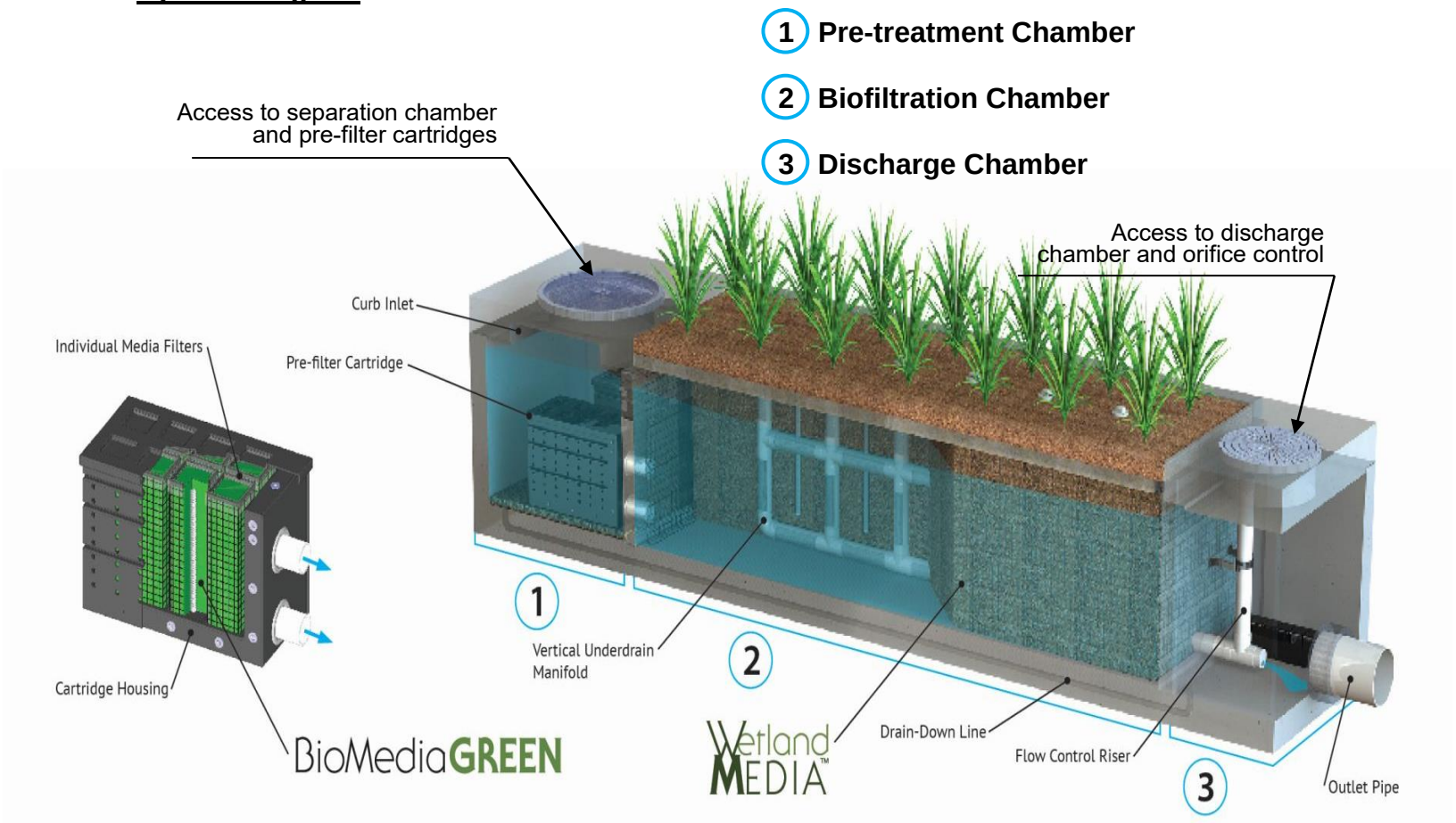
Inspection Guidelines for Modular Wetland System - Linear

Inspection Summary

- Inspect Pre-Treatment, Biofiltration and Discharge Chambers – average inspection interval is 6 to 12 months.
  - (1*5 minute average inspection time*).
- NOTE: Pollutant loading varies greatly from site to site and no two sites are the same. Therefore, the first year requires inspection monthly during the wet season and every other month during the dry season in order to observe and record the amount of pollutant loading the system is receiving.

System Diagram



Inspection Overview

As with all stormwater BMPs inspection and maintenance on the MWS Linear is necessary. Stormwater regulations require that all BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess the site specific loading conditions. This is recommended because pollutant loading and pollutant characteristics can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding on roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years to ensure appropriate maintenance is provided. Without appropriate maintenance a BMP will exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the MWS Linear:

- Modular Wetland Inspection Form
- Flashlight
- Manhole hook or appropriate tools to remove access hatches and covers
- Appropriate traffic control signage and procedures
- Measuring pole and/or tape measure.
- Protective clothing and eye protection.
- 7/16” open or closed ended wrench.
- Large permanent black marker (initial inspections only – first year)
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections of the system.

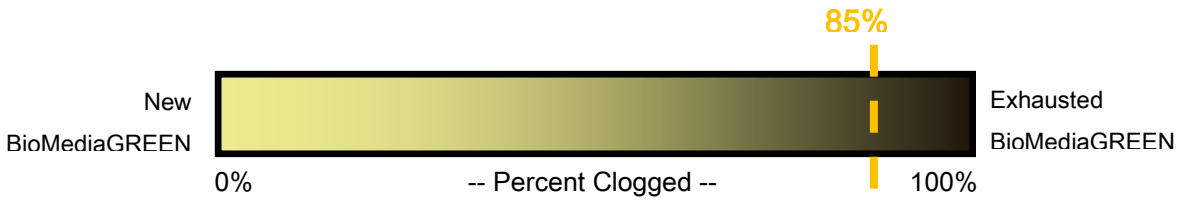
Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the MWS Linear are quick and easy. As mentioned above the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long term inspection and maintenance interval requirements.

The MWS Linear can be inspected though visual observation without entry into the system. All necessary pre-inspection steps must be carried out before inspection occurs, especially traffic control and other safety measures to protect the inspector and near-by pedestrians from any dangers associated with an open access hatch or manhole. Once these access covers have been safely opened the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the inside of the system through the access hatches. If minimal light is available and vision into the unit is impaired utilize a flashlight to see inside the system and all of its chambers.
- Look for any out of the ordinary obstructions in the inflow pipe, pre-treatment chamber, biofiltration chamber, discharge chamber or outflow pipe. Write down any observations on the inspection form.
- Through observation and/or digital photographs estimate the amount of trash, debris and sediment accumulated in the pre-treatment chamber. Utilizing a tape measure or measuring stick estimate the amount of trash, debris and sediment in this chamber. Record this depth on the inspection form.

- Through visual observation inspect the condition of the pre-filter cartridges. Look for excessive build-up of sediments on the cartridges, any build-up on the top of the cartridges, or clogging of the holes. Record this information on the inspection form. The pre-filter cartridges can further be inspected by removing the cartridge tops and assessing the color of the BioMediaGREEN filter cubes (requires entry into pre-treatment chamber – see notes above regarding confined space entry). Record the color of the material. New material is a light green in color. As the media becomes clogged it will turn darker in color, eventually becoming dark brown or black. Using the below color indicator record the percentage of media exhausted.



- The biofiltration chamber is generally maintenance free due to the system's advanced pre-treatment chamber. For units which have open planters with vegetation it is recommended that the vegetation be inspected. Look for any plants that are dead or showing signs of disease or other negative stressors. Record the general health of the plants on the inspection and indicate through visual observation or digital photographs if trimming of the vegetation is needed.
- The discharge chamber houses the orifice control structure, drain down filter and is connected to the outflow pipe. It is important to check to ensure the orifice is in proper operating conditions and free of any obstructions. It is also important to assess the condition of the drain down filter media which utilizes a block form of the BioMediaGREEN. Assess in the same manner as the cubes in the Pre-Filter Cartridge as mentioned above. Generally, the discharge chamber will be clean and free of debris. Inspect the water marks on the side walls. If possible, inspect the discharge chamber during a rain event to assess the amount of flow leaving the system while it is at 100% capacity (pre-treatment chamber water level at peak HGL). The water level of the flowing water should be compared to the watermark level on the side walls which is an indicator of the highest discharge rate the system achieved when initially installed. Record on the form is there is any difference in level from watermark in inches.

- NOTE: During the first few storms the water level in the outflow chamber should be observed and a 6” long horizontal watermark line drawn (using a large permanent marker) at the water level in the discharge chamber while the system is operating at 100% capacity. The diagram below illustrates where a line should be drawn. This line is a reference point for future inspections of the system:

Using a permanent marker draw a 6 inch long horizontal line, as shown, at the higher water level in the MWS Linear discharge chamber.

- Water level in the discharge chamber is a function of flow rate and pipe size. Observation of water level during the first few months of operation can be used as a benchmark level for future inspections. The initial mark and all future observations shall be made when system is at 100% capacity (water level at maximum level in pre-treatment chamber). If future water levels are below this mark when system is at 100% capacity this is an indicator that maintenance to the pre-filter cartridges may be needed.
- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components or cartridges.
- Obstructions in the system or its inlet or outlet.
- Excessive accumulation of floatables in the pre-treatment chamber in which the length and width of the chamber is fully impacted more than 18”.

- Excessive accumulation of sediment in the pre-treatment chamber of more than 6” in depth.

- Excessive accumulation of sediment on the BioMediaGREEN media housed within the pre-filter cartridges. The following chart shows photos of the condition of the BioMediaGREEN contained within the pre-filter cartridges. When media is more than 85% clogged replacement is required.

- Excessive accumulation of sediment on the BioMediaGREEN media housed within the drain down filter. The following photos show of the condition of the BioMediaGREEN contained within the drain down filter. When media is more than 85% clogged replacement is required.

- Overgrown vegetation.

- Water level in discharge chamber during 100% operating capacity (pre-treatment chamber water level at max height) is lower than the watermark by 20%.

Inspection Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.

2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.

3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

4. Entry into chambers may require confined space training based on state and local regulations.

5. No fertilizer shall be used in the Biofiltration Chamber.

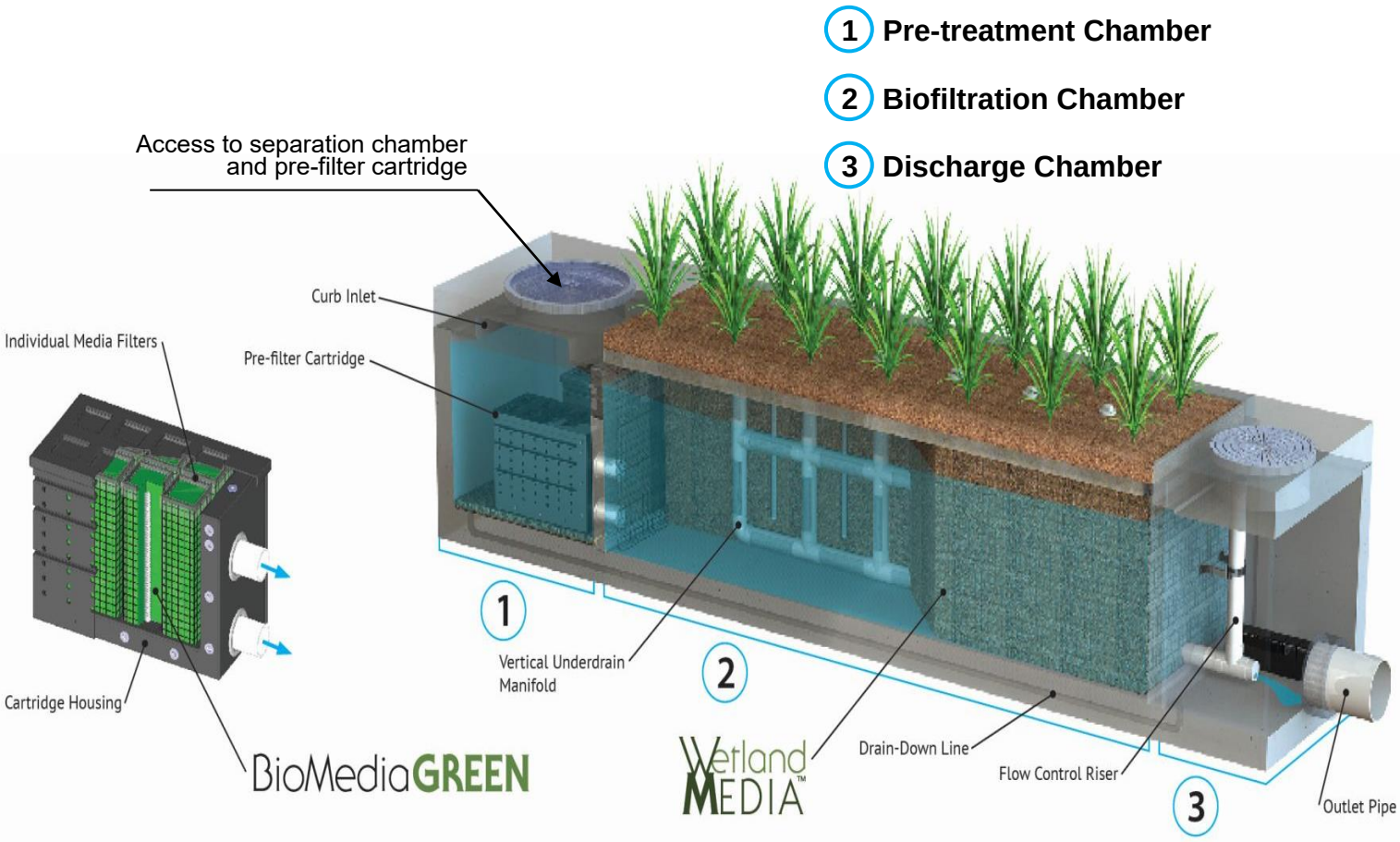
6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may not require irrigation after initial establishment.

Maintenance Guidelines for Modular Wetland System - Linear

Maintenance Summary

- Remove Sediment from Pre-Treatment Chamber – average maintenance interval is 12 to 24 months.
  - (*10 minute average service time*).
- Replace Pre-Filter Cartridge Media – average maintenance interval 12 to 24 months.
  - (*10-15 minute per cartridge average service time*).
- Trim Vegetation – average maintenance interval is 6 to 12 months.
  - (*Service time varies*).

System Diagram



Maintenance Overview

The time has come to maintain your Modular Wetland System Linear (MWS Linear). To ensure successful and efficient maintenance on the system we recommend the following. The MWS Linear can be maintained by removing the access hatches over the systems various chambers. All necessary pre-maintenance steps must be carried out before maintenance occurs, especially traffic control and other safety measures to protect the inspector and near-by pedestrians from any dangers associated with an open access hatch or manhole. Once traffic control has been set up per local and state regulations and access covers have been safely opened the maintenance process can begin. It should be noted that some maintenance activities require confined space entry. All confined space requirements must be strictly followed before entry into the system. In addition the following is recommended:

- Prepare the maintenance form by writing in the necessary information including project name, location, date & time, unit number and other info (see maintenance form).
- Set up all appropriate safety and cleaning equipment.
- Ensure traffic control is set up and properly positioned.
- Prepare a pre-checks (OSHA, safety, confined space entry) are performed.

Maintenance Equipment

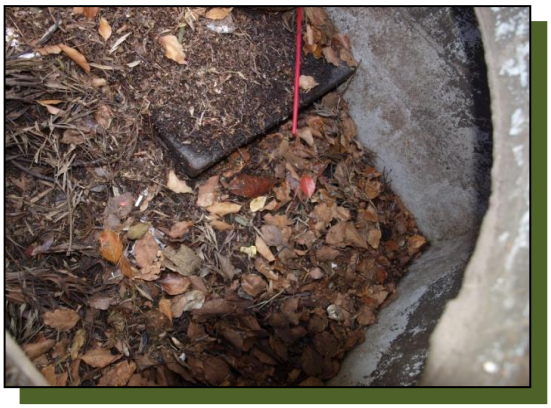
Following is a list of equipment required for maintenance of the MWS Linear:

- Modular Wetland Maintenance Form
- Manhole hook or appropriate tools to access hatches and covers
- Protective clothing, flashlight and eye protection.
- 7/16” open or closed ended wrench.
- Vacuum assisted truck with pressure washer.
- Replacement BioMediaGREEN for Pre-Filter Cartridges if required (order from manufacturer).

Maintenance Steps

1. Pre-treatment Chamber (bottom of chamber)

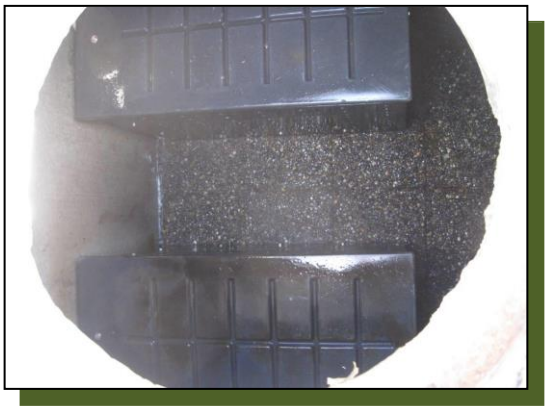
   A. Remove access hatch or manhole cover over pre-treatment chamber and position vacuum truck accordingly.
   B. With a pressure washer spray down pollutants accumulated on walls and pre-filter cartridges.
   C. Vacuum out Pre-Treatment Chamber and remove all accumulated pollutants including trash, debris and sediments. Be sure to vacuum the floor until pervious pavers are visible and clean.
   D. If Pre-Filter Cartridges require media replacement move onto step 2. If not, replace access hatch or manhole cover.



Removal of access hatch to gain access below.

Insertion of vacuum hose into separation chamber.

Removal of trash, sediment and debris.



Fully cleaned separation chamber.

2. Pre-Filter Cartridges (attached to wall of pre-treatment chamber)

A. After finishing step 1 enter pre-treatment chamber.

B. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.

Pre-filter cartridges with tops on.

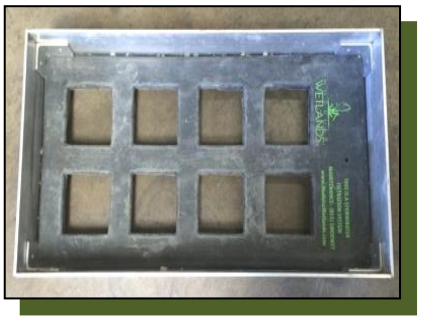
Inside cartridges showing media filters ready for replacement.

C. Place the vacuum hose over each individual media filter to suck out filter media.

Vacuuming out of media filters.

D. Once filter media has been sucked use a pressure washer to spray down inside of the cartridge and it's containing media cages. Remove cleaned media cages and place to the side. Once removed the vacuum hose can be inserted into the cartridge to vacuum out any remaining material near the bottom of the cartridge.

E. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase. Utilize the manufacture provided refilling trey and place on top of cartridge. Fill trey with new bulk media and shake down into place. Using your hands slightly compact media into each filter cage. Once cages are full removed refilling trey and replace cartridge top ensuring bolts are properly tightened.



Refilling trey for media replacement.

Refilling trey on cartridge with bulk media.

F. Exit pre-treatment chamber. Replace access hatch or manhole cover.

3. Biofiltration Chamber (middle vegetated chamber)

A. In general, the biofiltration chamber is maintenance free with the exception of maintaining the vegetation. Using standard gardening tools properly trim back the vegetation to healthy levels. The MWS Linear utilizes vegetation similar to surrounding landscape areas therefore trim vegetation to match surrounding vegetation. If any plants have died replace plants with new ones:

4. Discharge Chamber (contains drain down cartridge & connected to pipe)

A. Remove access hatch or manhole cover over discharge chamber.

B. Enter chamber to gain access to the drain down filter. Unlock the locking mechanism and left up drain down filter housing to remove used BioMediaGREEN filter block as shown below:

C. Insert new BioMediaGREEN filter block and lock drain down filter housing back in place. Replace access hatch or manhole cover over discharge chamber.

Inspection Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.

2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.

3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

4. Entry into chambers may require confined space training based on state and local regulations.

5. No fertilizer shall be used in the Biofiltration Chamber.

6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may not require irrigation after initial establishment.

Inspection Report
Modular Wetlands System

Project Name _____

Project Address _____ (city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ___/___/___ Time _____ AM / PM

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): _____ Size (22', 14' or etc.): _____

Structural Integrity:	**Yes**	**No**	**Comments**
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?			
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?			
Working Condition:			
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?			
Is there standing water in inappropriate areas after a dry period?			
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?			
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes, specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.			Depth:
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber:
Any signs of improper functioning in the discharge chamber? Note issues in comments section.			
Other Inspection Items:			
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?			
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.			
Is there a septic or foul odor coming from inside the system?			

Waste:	**Yes**	**No**
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes: _____

2972 San Luis Rey Road, Oceanside, CA 92058 P (760) 433-7640 F (760) 433-3176

Cleaning and Maintenance Report
Modular Wetlands System

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:	MWS Catch Basins						
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments:

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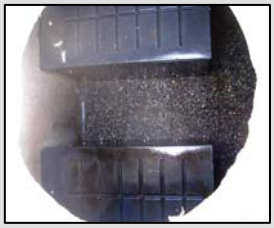
Modular Wetland System - Linear (MWS-Linear)

Maintenance Schedule

MWS - LINEAR	Cleaning Required	Est. Cleaning Time
Year 1	1) Clean Inlet Filter (6 Month Intervals) (does not apply to vault type) 2) Vacuum Catch Basin (12 Month Intervals) 3) Replace BioMedia Green Filter Media (12 month Intervals)	10 Minutes 25 Minutes 45 Minutes
Year 2	1) Clean Inlet Filter (6 Month Intervals) (does not apply to vault type) 2) Vacuum Catch Basin (12 Month Intervals) 3) Replace BioMedia Green Filter Media (12 month Intervals)	10 Minutes 25 Minutes 45 Minutes
Year 3	1) Clean Inlet Filter (6 Month Intervals) (does not apply to vault type) 2) Vacuum Catch Basin (12 Month Intervals) 3) Replace BioMedia Green Filter Media (12 month Intervals)	10 Minutes 25 Minutes 45 Minutes
Year 4	1) Clean Inlet Filter (6 Month Intervals) (does not apply to vault type) 2) Vacuum Catch Basin (12 Month Intervals) 3) Replace BioMedia Green Filter Media (12 month Intervals)	10 Minutes 25 Minutes 45 Minutes
Year 5	1) Clean Inlet Filter (6 Month Intervals) (does not apply to vault type) 2) Vacuum Catch Basin (12 Month Intervals) 3) Replace BioMedia Green Filter Media (12 month Intervals)	10 Minutes 25 Minutes 45 Minutes
Year 6	1) Clean Inlet Filter (6 Month Intervals) (does not apply to vault type) 2) Vacuum Catch Basin (12 Month Intervals) 3) Replace BioMedia Green Filter Media (12 month Intervals)	10 Minutes 25 Minutes 45 Minutes
Year 7	1) Clean Inlet Filter (6 Month Intervals) (does not apply to vault type) 2) Vacuum Catch Basin (12 Month Intervals) 3) Replace BioMedia Green Filter Media (12 month Intervals)	10 Minutes 25 Minutes 45 Minutes
Year 8	1) Clean Inlet Filter (6 Month Intervals) (does not apply to vault type) 2) Vacuum Catch Basin (12 Month Intervals) 3) Replace BioMedia Green Filter Media (12 month Intervals)	10 Minutes 25 Minutes 45 Minutes
Year 9…	1) Clean Inlet Filter (6 Month Intervals) (does not apply to vault type) 2) Vacuum Catch Basin (12 Month Intervals) 3) Replace BioMedia Green Filter Media (12 month Intervals)	10 Minutes 25 Minutes 45 Minutes
Year 15	1) Clean Inlet Filter (6 Month Intervals) (does not apply to vault type) 2) Vacuum Catch Basin (12 Month Intervals) 3) Replace BioMedia Green Filter Media (12 month Intervals) 4) Remove & Replace Wetland Plants & Media (every 10-20 years)	10 Minutes 25 Minutes 45 Minutes 6 to 8 Hours
Procedure 1 **Clean Inlet Filter** (does not apply to vault type) 	Modular Wetland Systems, Inc. recommends the catch basin filter be inspected and cleaned a minimum of once every six months and replacement of hydrocarbon booms once a year. The procedure is easily done with the use of any standard vacuum truck. Before doing maintenance please use proper safety and traffic control. 1) Remove grate or manhole, remove the deflector shield (grate type only). Note: entry into an underground stormwater vault such as an inlet vault requires certification in confined space training. 2) Remove all trash, debris, organics, and sediments collected by the inlet filter insert either manually or with the use of a vactor truck. 3) Evaluate hydrocarbon boom. If the boom is filled with hydrocarbons and oils it should be replaced. Attach new boom to basket with plastic ties through pre-drilled holes in basket. Place the deflector shield (grate type only) back into the filter. Hydrocarbon boom should be replaced annually. (The hydrocarbon boom may be classified as hazardous material and will have to be picked up and disposed of as hazardous waste).	**10 Minutes**

Procedure 2 **Vacuum Catch Basin** 	Modular Wetland Systems, Inc. recommends the separation chamber be inspected and cleaned a minimum of once a year. The procedure is easily done with the use of any standard vacuum truck. Before doing maintenance please use proper safety and traffic control. 1) Remove grate or manhole. 2) Remove catch basin filter. 3) Spray down pollutants accumulated on cartridge filters and catch basin walls. 4) Vacuum out sediments and debris accumulated on catch basin floor. 5) Replace catch basin filter, and replace grate or manhole cover.	**25 Minutes**
Procedure 3 **Replace BioMedia Green Media Filter**   	Modular Wetland Systems, Inc. recommends the BioMediaGREEN Cartridge Filters be inspected and cleaned a minimum of once a year. The procedure will require prior maintenance of catch basin. Before doing maintenance please use proper safety and traffic control. 1) Remove grate, remove catch basin filter. 2) Perform maintenance activities on catch basin. 3) Enter separation chamber, unscrew the two bolts holding the lid on the cartridge filter. This will expose the 14 pieces of BioMediaGREEN in each cartridge. 4) Evaluate media condition, replace if necessary. If the spaces between the media are filled with sediment and the surface of the media is dark brown or black the media should be replaced. The old media can be removed by hand by pulling the media pieces up out of the cartridge and taking them out of the catch basin. 5) Once all old media is removed, spray down the interior of the cartridge and vacuum out accumulated debris. 6) Use new pieces of BioMediaGREEN and slide down over the perforated PVC risers. The media will only go in one way for easy installation. Replace media over all risers. 5) Replace cartridge filter lid, replace catch basin filter, and replace grate or manhole cover. Modular Wetland Systems, Inc. recommends the drain down filter be inspected and maintained a minimum of once a year. 1) Open hatch of discharge chamber, enter chamber. 2) Unlatch fiberglass cover, remove media block, replace with new block, replace and latch cover. 3) Exit chamber, close and lock down the hatch. BioMediaGREEN	**45 Minutes**
Procedure 4 **Replace Wetland Media** 	Modular Wetland Systems, Inc. recommends the wetland media be evaluated every 3 to 5 years to test flow rate. The media life is approximately 15 to 20 years. The wetland media is an expanded shale that can be ordered from the manufacturer or independent supplier. If the flow through the wetland filter is decreasing the internal inflow and outflow pipes leading to and from the wetland chamber can be jetted. If the flow through the wetland is still minimal then the media may need to be replaced. To replace the media the following steps are required. Before doing maintenance please use proper safety and traffic control. 1) Remove plants and dispose. Have new plants standing ready to plant. 2) Use a larger vacuum truck to remove the media from the wetland chamber. 3) Spray down the chamber walls and remove all sediment and water. 4) Replace with new wetland media and plant plants.	**6 to 8 Hours**

Bio Clean

A Forterra Company

Bio Clean CPS

A Stormwater Trash Capture Solution

OPERATION & MAINTENANCE MANUAL

5796 Armada Drive Suite 250 | Carlsbad, CA 92008 | 855.566.3938

stormwater@forterrabp.com | biocleanenvironmental.com

OPERATION & MAINTENANCE

CPS devices should be maintained by individuals who are trained in proper disposal procedures, confined space entry and traffic safety regulations. When servicing a Bio Clean CPS device be sure to follow all safety and traffic control protocols as well as wearing all proper personal protection equipment such as gloves, safety glasses, hard-hat, safety vest and work boots.

Visual Inspection

1. Begin by inspecting the inflow of the catch basin where the Bio Clean CPS device is located. Check for any obstructions to inflow of the CB unit. If any large obstructions are found, have them removed. Once the inflow inspection is completed, remove the man-hole cover for further inspection. (Note: Confined Space Entry Procedures may apply if trained personnel intend to enter the interior space of any Catch Basin. Please follow all applicable confined space entry procedures)

2. Remove the manhole cover and visually estimate the amount and types of debris found in the CB unit. Look for any visual signs of damage that may compromise the CB unit to function properly. Inspect for any standing water in the CB unit as well as for large amounts of sediment and debris surrounding the CPS device. If standing water and high sediment volume is found, remove water, sediment and debris by vacuum truck or by other debris removal methods.

Cleaning Procedures and Frequencies

1. Like all other storm water BMP's, Bio Clean CPS devices require periodic maintenance. Routine inspection and maintenance intervals for all CPS devices are typically twice per year for inspections and once per year for maintenance service. Bio Clean CPS devices may require more frequent maintenance service if the device is located in a high debris loading drainage area, such as certain downtown areas, retail/restaurant, or residential areas where a significant amount of vegetation/foliage is located. In such cases, Bio Clean CPS devices may require more frequent inspection and maintenance service, which could range from twice per year to monthly inspection and maintenance service, depending on pollutant load conditions.

2. To begin Bio Clean CPS cleaning procedures, conduct a visual inspection of the CPS device and the surrounding area to ensure a safe working environment. Setup appropriate barriers and signage as necessary to establish a work zone surrounding the catch basin. Once the work zone has been established, remove the manhole cover from the catch basin.

3. Once the manhole cover is removed from the basin the Bio Clean CPS is ready for servicing. All debris can be removed by either a vacuum truck or manually removing sediment and debris by hand.

4. Bio Clean CPS devices shall be cleaned using a pressure washer as may be necessary if any materials are found to cause occlusion or clogging of the screen.

Disposal

1. All trash and debris removed from the Bio Clean CPS unit shall be disposed of in accordance with local, state and federal regulation.

2. Solid waste disposal can be coordinated with local landfills. Liquids may need to be disposed of by wastewater treatment plant, municipal vacuum truck decant facility or approved facility.

For Maintenance Services or Information Please Contact Us At:
760-433-7640
Or Email:
info@biocleanenvironmental.com

Attachment E

Geotechnical Report

PRELIMINARY GEOTECHNICAL REPORT
for
Prospect Avenue & 17th Street
Tustin, California

Prepared For:

Kingsbarn Reality Capital
1645 Village Center Circle, Suite 200
Las Vegas, Nevada 89134

Prepared By:

Langan CA, Inc.
18575 Jamboree Road, Suite 150
Irvine, CA 92612

6 September 2024
700159001

LANGAN

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Principal / Vice President, GE #3042

6 September 2024

700159001

LANGAN

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APPENDICES

1. INTRODUCTION

In accordance with the Proposal for Preliminary Geotechnical Engineering Services Agreement dated 19 July 2024 and subsequent authorization by Kingsbarn Realty Capital, Langan CA, Inc. (LANGAN) has completed a preliminary geotechnical investigation for the proposed multi-family development (Project) located at Prospect Avenue and 17th Street, Tustin, California (Site). The purposes of this report are to summarize our understanding of existing conditions, proposed development, subsurface investigation and findings, and geotechnical recommendations, seismic design, and foundation support recommendations for the proposed development. Recommendations provided herein are in accordance with the 2022 California Building Code (CBC).

2. PROJECT UNDERSTANDING

2.1 Existing Site Description

The approximately 8.5 acre Site is occupied by five concrete buildings with asphalt surface parking lots and landscaping. The Site is bound by 17th Street to the north, Prospect Avenue to west, and residential developments to the south and east. Ground surface elevations within the Site range from approximately 160 to 164 feet North American Vertical Datum 1988 (NAVD88). Refer to Figure 1 for a Site Vicinity Map.

2.2 Proposed Development

Based on a schematic plan provided by Kingsbarn[1], the proposed development will consist of the demolition of the existing commercial structures and construction of multi-family structures including 3-story, at-grade duplexes and townhomes, a recreation center, and appurtenant improvements.

3. REVIEW OF AVAILABLE INFORMATION

We reviewed publicly available geotechnical and geologic information at or near the Site, publicly available geologic reports, and historic aerial images for the Site. Referenced information included reports, maps, and websites from the agencies listed below:

- United States Geological Survey (USGS),
- California Geological Survey (CGS)
- Federal Emergency Management Agency (FEMA), and
- California Geologic Energy Management Division (CalGEM) previously known as the Division of Oil, Gas & Geothermal Resources (DOGGR).

3.1 Regional and Local Geologic Setting

The subject site is located at the eastern end of the Los Angeles Basin, a northwest trending, alluviated lowland situated at the north end of the Peninsular Ranges geomorphic province of coastal southern California. This basin, which is the surface expression of a deep structural trough, has been subdivided into four primary structural blocks distinguished from one another by contrasting basement rock types and stratigraphy. These structural blocks are generally separated by zones of faulting along which movement has been occurring intermittently since middle Miocene time (Yerkes and others, 1965). The site is located at the southeastern end of

[1] Schematic plan titled "Prospect & 17th, Tustin, CA, Site Plan – Study C" prepared by Urban Arena dated 8 May 2024.

the Central Block of the Los Angeles Basin, a wedge-shaped area that extends from the Santa Monica Mountains at its northwest end to the San Joaquin Hills at its southeast end.

A review of published geologic maps indicates that the subject site and adjacent areas are underlain by Quaternary-age, old alluvial fan deposits comprising the flood plains of the Santa Ana River and ancestral Santiago Creek. The referenced literature indicates that the older alluvial fan deposits consist generally of gravel, clay, and sand (Morton, 2004, Morton and Miller, 1981). Unconsolidated deposits within the Los Angeles Basin are typically on the order of several thousand feet in thickness (Yerkes, et al, 1965) though are likely considerably thinner at the southeastern end. These native materials are overlain locally by artificial fill where previously existing natural grades have been modified as part of recent urbanization. This subsurface profile was generally confirmed during the site-specific investigation recently conducted by our firm. See Figure 2 for a geologic map.

3.2 Geologic Hazards Review

LANGAN's geologic hazard review was performed in general accordance with CGS "Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California" and the 2022 CBC. The following subsections present the results of the review of geologic hazards as they pertain to the Site.

- Regional Faulting – We reviewed the CGS 2010 Fault Activity Map of California (see Figure 3A) and the accompanying document, "An Explanatory Text to the Fault Activity Map of California" (see Figure 3B) to identify mapped faults within 100 kilometers of the Site. The closest known, active fault are the Quaternary- to late-Quaternary-aged the El Modeno and Peralta Hills fault zone, located approximately 4 to 4.5 miles north of the Site. The next closest fault is the latest-Quaternary-aged San Joaquin Hills fault zone, located approximately 5 miles south of the Site.

  The Site is in a seismically active area that has historically been affected by generally moderate to occasionally high levels of ground motion. Due to the Site's proximity to several currently mapped active faults, the proposed development will likely experience moderate to occasionally high ground shaking from these faults as well as ground shaking from other seismically active areas of southern California.

- Regional Seismicity – A search of the USGS ANSS Comprehensive Earthquake Catalog (ComCat), using a web-based Earthquake Archive Search and URL Builder tool, found that as of 28 August 2024, 53 earthquakes with magnitudes greater than 5.0 have occurred within a 100 kilometer radius of the Site since 1800. A summary of the USGS ANSS ComCat reported earthquake events are provided in Appendix A. These earthquake epicenters relative to the Site are displayed graphically on Figure 3A.

- Surface Rupture – Alquist-Priolo Earthquake Fault Zones (APEFZ) are regulatory zones established by California's State Geologist around active faults with the potential to cause surface rupture. The zones vary in width; however, they average approximately 1/4 mile wide. According to the CGS map titled "State of California, Seismic Hazard Zones, Orange Quadrangle" released 15 April 1998, the Site is not mapped within a currently established zone of required investigation for Alquist-Priolo Earthquake Fault Zone.

- Historically High Groundwater – As stated previously, based on the CGS report "Seismic Hazard Zone Report for the Orange 7.5-Minute Quadrangle", the historical high

groundwater near the site is on the order of 40 feet bgs. See Figure 4 for a historically highest groundwater map.

- Liquefaction – Liquefaction is a transformation of soil from a solid to a liquefied state during which saturated soil temporarily loses strength resulting from the buildup of excess pore water pressure, especially during earthquake-induced cyclic loading. Soil susceptible to liquefaction includes loose to medium dense sand and gravel and low-plasticity silts. According to the CGS map titled "State of California, Seismic Hazard Zones, Orange Quadrangle" released 15 April 1998, the Site is not mapped in a zone of required investigation for liquefaction. See Figure 5 for a seismic hazard zones map.

  Due to the relatively dense to very dense, native soil below the historic high groundwater level underlying the site, the potential for liquefaction at the site is very low. The potential for liquefaction is further discussed in Section 6.2.

- Lateral Spreading – Lateral spreading is a phenomenon in which surficial soil displaces along a shear zone that has formed within an underlying liquefied layer. The surficial blocks are transported downslope or in the direction of a free face, such as a slope, by earthquake and gravitational forces. The Site is judged to have very low potential for liquefaction and there are no significant slopes adjacent to the Site. Therefore, we judge that the potential for lateral spreading is negligible.

- Seismic-Induced Ground Deformations – Seismic-induced ground deformations include ground surface settlement and differential settlement resulting from (1) liquefaction of saturated cohesionless soils and (2) seismic densification, or differential compaction, of unsaturated sands and gravels caused by earthquakes. The potential for seismic-densification induced ground settlement is discussed in Section 6.2.

- Earthquake-Induced Landslide Areas – Based on CGS map titled "Seismic Hazard Zone Report for the Orange Quadrangle", the Site is not mapped in a zone of required investigation for earthquake induced landslides. The Site is generally flat and does not have sloped boundary conditions. Therefore, we judge that the potential for landsliding at the Site is negligible. See Figure 5 for a seismic hazard zones map.

- Flood Mapping – Based on the FEMA Flood Insurance Rate Map (FIRM) Number 06059C0164J, dated 3 December 2009, the Site is mapped within Zone X, which is defined as "areas of 0.2 percent chance flood hazard; areas of 1 percent annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1 percent annual chance flood."

- Tsunami and Seiche – A tsunami is a long high sea wave caused by an earthquake, submarine landslide, or other underwater disturbance. A seiche is an oscillation of surface water in an enclosed or semi-enclosed basin such as a lake, bay, or harbor. The Site is not located near the coast or body of water and therefore, we judge the potential for a tsunami or seiche to be low.

- Inundation from Dam Failure – Based on a review of the California Division of Safety of Dams (DSOD) website, the Site is mapped within an inundation area in the case of failure of the Villa Park dam. The inundation maps are prepared by licensed civil engineers and submitted by dam owners for DSOD review and approval. An emergency action plan has been developed for the Villa Park Dam.

- Subsidence – Land subsidence may be induced from withdrawal of oil, gas, or water from wells. Based on a search of the Cal GEM (formerly the Division of Oil, Gas & Geothermal Resources (DOGGR)) Well Finder online tool, there are no wells present within one mile of the Site. Therefore, we judge that the potential for land subsidence due to the withdrawal of oil, gas, or water from wells is negligible.
- Expansive Soils – Expansive soils are soils that change in volume when the soil moisture content changes. The volume change occurs when the moisture content in the soil causes swelling or shrinking because of cyclic wet/dry weather cycles, installation of irrigation systems, change in landscape plantings, or changes in grading. Swelling and shrinking soils can result in differential movement of structures including floor slabs and foundations, and site work including hardscape, utilities, and sidewalks. The 2022 CBC defines potentially expansive soils as soils with expansion indices (EI) greater than 20. The expansion potential of near-surface soils at the Site is discussed in Section 6.6.

3.3 Historic Site Conditions

We reviewed historic aerial photos that depict the site between 1931 and 1990 from the County of Orange and NETR Online, Historical Aerial Imagery databases. The Site was agricultural land and was undeveloped from 1931 until the early 1970s. The northernmost two buildings at the Site are visible in the aerial photo from 1972. The remaining three buildings (five total) are visible in the aerial photo from 1980 and exist presently.

4. SUBSURFACE INVESTIGATION

4.1 LANGAN Borings

LANGAN's field investigation consisted of drilling three (3) geotechnical borings, identified as LB-1 through LB-3. The borings were advanced to depths of approximately 26½ to 51½ feet bgs. The borings were performed at accessible locations within the parking lot of the Site. Refer to Figure 6 for approximate boring locations.

The borings were drilled on 9 August 2024 by Martini Drilling, Corporation under full-time engineering observation of our field engineer. All borings were drilled using a CME 75 truck-mounted drill rig equipped with hollow stem auger drilling equipment.

Before conducting the subsurface investigation, boring locations were located and marked in the field by a LANGAN field engineer. Underground Service Alert of California (DigAlert) was contacted to locate and mark known public underground utilities present within the public right-of-way. A private utility-locating subcontractor also performed checks for detectable underground utilities at the boring locations using geophysical techniques to confirm the locations were clear of subsurface utilities and obstructions. An Orange County Well/Exploratory Boring permit was applied for and was conditionally approved on 29 July 2024 for drilling to occur.

Standard Penetration Tests (SPT)[2] were generally performed at 5-foot intervals. SPT N-values were recorded to identify the relative density or stiffness of the cohesionless and cohesive soils, respectively. Modified California ring samples were taken at select locations using a 3.0-inch-outer-diameter thick-walled split barrel sampler lined with 2.42-inch-inner-diameter rings.

[2] The Standard Penetration Test is a measure of the soil density and consistency. The SPT N-value is defined as the number of blows required to drive a 2-inch outer diameter split-barrel sampler 12 inches, after an initial penetration of 6 inches, using a 140-pound automatic hammer free falling from a height of 30 inches.

Soil samples were visually examined and classified in the field in accordance with the Unified Soil Classification System (USCS). Subsurface conditions encountered within the borings are summarized below and in the boring logs included in Appendix B.

Upon completion, the borings were backfilled via tremie method with cement-grout and then surface patched with quick-set concrete. Drill cuttings from the borings were temporarily stored on-site in Department of Transportation (DOT) approved 55-gallon drums for subsequent characterization and disposal.

4.2 Geotechnical Laboratory Testing

Soils samples obtained from the borings were visually examined in the field, and classifications were confirmed by re-examination in our office. Geotechnical laboratory testing was performed on select soil samples for the below testing regime:

- Particle Size Analyses – ASTM D6913
- Moisture Content and Density – ASTM D2216 & D7263
- Atterberg Limits – ASTM D4318
- Expansion Index – ASTM D4829
- Corrosion Tests
    - Resistivity and pH – CA Test 643
    - Sulfate Content – CA Test 417
    - Chloride Content – CA Test 422
- R-value – ASTM D2844

The laboratory testing was performed by AP Engineering & Testing, Inc. We reviewed the results of the laboratory test data and present them in Appendix C.

5. SUBSURFACE CONDITIONS

LANGAN's interpretation of the subsurface conditions is based on soils encountered during our field investigation. In general, subsurface conditions within the Site consisted of undocumented, artificial fill underlain by native, old alluvial fan deposits. Our interpretation of the subsurface conditions based on the borings and laboratory test results is summarized below.

- Artificial Fill – Artificial, undocumented fill was encountered under the asphalt pavement to a depth of approximately 3 to 4 feet bgs. In general, the fill encountered at the site consisted of brown, medium stiff, clay, and tannish brown, poorly graded sand, with varying amounts of cobbles and silt, possibly due to the prior agricultural use of the site.
- Old Alluvial Fan Deposits – Pleistocene-age older fan deposits were encountered under the fill. The fan deposits generally consist of dense to very dense, grayish to brown, poorly graded sand with varying amounts of gravel and cobbles, and stiff to hard, brown clay that extends to the maximum explored depth of approximately 51½ feet bgs. Localized lenses of medium dense sand were encountered within the upper approximately 25 feet. The clay that comprises the upper portion (depths of approximately 3 to 7 feet) of the fan deposits is soft to medium stiff.

- Groundwater – Groundwater was not encountered during the field investigation to the maximum explored depth of 51½ feet bgs. The depth to historic high groundwater is mapped to be on the order of 40 feet bgs.

Table 1 – Moisture Content and Density Test Results

Sample	Depth (feet)	Dry Density (pcf)	Moisture Content (%)
LB-2, S-1	5	114	13.0
LB-2, S-5	20	NA	16.8

6. PRELIMINARY GEOTECHNICAL EVALUATION AND DESIGN RECOMMENDATIONS

Our geotechnical evaluation and recommendations for seismic, foundation, floor slab support, and pavement design, and corrosion are provided below. From a geotechnical standpoint, we conclude the project can be constructed as planned, provided the recommendations presented in this report are incorporated into the project plans and specifications and implemented during construction.

6.1 Seismic Design Parameters

Seismic design parameters for the project were determined in accordance with the procedures outlined in Section 1613 of the 2022 California Building Code (CBC), and Chapter 11 of American Society of Civil Engineers (ASCE) 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures. Based on our evaluation of the subsurface conditions at the site, the soils underlying the site may be characterized as Seismic Site Class D, in accordance with Chapter 20 of ASCE 7-16. As such, the following preliminary seismic design criteria shown in Table 2 may be used for seismic design.

Table 2 – Seismic Design Criteria

Criteria	Value[1]
MCE_R[2] Ground Motion at Short Periods, S_s	1.311g
MCE_R[2] Ground Motion at 1 Second Period, S_1	0.467g
Site Amplification Factor at 0.2 second, F_a	1.0g
Site Amplification Factor at 1.0 second, F_v	1.7g
Site-Modified Spectral Acceleration Value at Short Periods, S_{MS}	1.311g
Site-Modified Spectral Acceleration Value at 1 Second Period, S_{M1}	1.191g [3,4]
Design Spectral Response Acceleration at short periods, S_{DS}	0.874g
Design Spectral Response Acceleration at 1 second period, S_{D1}	0.794g [3]
MCE_G[5] Peak Ground Acceleration, PGA_M	0.581g

Notes:
1. Values based on Site Class D
2. MCE_R = Risked-Targeted Maximum Considered Earthquake
3. Values of S_{M1} and S_{D1} assume the exceptions of ASCE 7-16 Section 11.4.8 are met.
4. Value of S_{M1} has been increased by 50 percent per Supplement 3 of ASCE 7-16.
5. MCE = Geometric mean Maximum Considered Earthquake.

The recommend values above assume Exception No. 2 of Section 11.4.8 of ASCE 7-16 will be used for seismic design, and that the structures will not be classified as a seismically isolated structure or structure with damping systems.

The structural engineer should confirm the structural fundamental period of vibration and the seismic design approach (i.e. if the exceptions in Section 11.4.8 of ASCE 7-16 will be used). If the structural engineer elects not to use the exceptions of Section 11.4.8 of ASCE 7-16 or the structure will be designed as a seismically isolated structure or structure with damping systems, then a site-specific ground motion hazard analysis in accordance with Section 21.2 of ASCE 7-16 will be required for developing the seismic design criteria.

6.2 Seismic Densification-Induced Settlements

To estimate seismic-densification induced (dry sand) settlements, we used the blow count corrections proposed by Idriss and Boulanger (2008) and procedures outlined in Tokimatsu and Seed (1984). A Maximum Considered Earthquake geometric mean (MCE_G) peak ground acceleration (PGA_M) of 0.649g and a mean moment magnitude of 6.65, based on a deaggregation of the 2,475-year return period hazard level, were used in our analysis. Based on our analysis, seismic-densification induced settlements are preliminarily anticipated to be no more than ½ inch.

6.3 Foundation Design

In general, the existing undocumented, artificial fill at the site is considered unsuitable for support of the proposed structures and other improvements. Prior to construction of new structures, the existing fill will need to be removed and replaced with recompacted fill. The clay can be reused as recompacted fill but may need to be mixed with non-expansive material within the upper 3 feet of the building slabs. The engineered fill pads should extend laterally five feet beyond foundation footprints.

Provided soil mitigation is performed as recommended above, a preliminary bearing value of 3,000 pounds per square foot (psf) may be used for continuous and isolated footings bearing a minimum depth of 24 inches below the lowest adjacent grade and having a minimum width of 12 inches. Recommended allowable bearing values include both dead and live loads and may be increased by one-third for wind and seismic forces.

Footing static settlements of less than ½ inch and differential settlements of less than ½ inch over 50 feet are anticipated with foundations bearing on appropriately prepared engineered fills or competent fan deposits. Seismically densification-induced settlements are anticipated to be no more than ½ inch.

Footing excavations should be performed using a backhoe bucket fitted with a smooth steel plate welded across the bucket teeth to minimize disturbance during excavation and to provide a smooth bearing surface.

The footing subgrades should be firm and unyielding, inspected and approved by a qualified geotechnical engineer prior to steel or concrete placement.

Foundations should be constructed as soon as possible following subgrade approval. The contractor shall be responsible for maintaining the subgrade in its as approved condition (i.e. free of water, debris, etc.) until the footing is constructed.

Preliminarily, we recommend an allowable passive resistance be calculated using a lateral pressure corresponding to an equivalent fluid pressure of 270 pounds per cubic foot (pcf); the

upper foot of soil should be ignored unless confined by a concrete slab or pavement. Frictional resistance should be computed using an allowable base friction coefficient of 0.30. The passive resistance and base friction values include a factor of safety of about 1.5 and can be used to resist total loads (including wind and/or seismic loads). They may be used in combination without reduction.

6.4 Floor Slabs

LANGAN anticipates the proposed floor slab can be designed as a slab-on-grade bearing on a minimum of 3 feet of compacted fill. The slab subgrade should be compacted; any loose or soft areas should be removed.

LANGAN recommends that slabs be designed using the following recommendations:

- Subgrade modulus, k, equal to 120 pounds per cubic inch (pci);
- 4-inch minimum thickness;
- For moisture-sensitive floor areas, a moisture barrier, consisting of a 15-mil polyethylene water vapor retarder over a minimum of four inches of capillary break as required by 2022 CBC Section 1805.4.1, shall be placed between the soil subgrade and concrete floor slab. The capillary break should consist of open graded, free draining, virgin material with a gradation that meets the requirements of the 2022 CBC.
- Steel reinforcing should be designed by the project's Structural Engineer presuming low expansion potential soil and sufficient to meet shrinkage reinforcement limits.

6.5 Pavement Recommendations

The appropriate pavement section depends on the type and strength of subgrade soil, traffic load, and planned pavement life. For the subgrade soil, an R-Value of 24 was used in the pavement analysis and based on laboratory results. The following daily vehicle traffic and classification types were assumed for the design: 610 class II, 5 class III, and 1 class VI for a pavement design life of 20 years. Vehicular pavement recommendations should be confirmed for the final pavement design.

Preliminary flexible pavement sections for auto parking areas, truck paving, and rigid pavement section have been developed with the parameters summarized in the following tables. Flexible and rigid pavement recommendations provided herein are in accordance with the California Department of Transportation and 1993 AASHTO – Pavement Structural Design guidelines, respectively.

Table 3 – Pavement Recommendations

Pavement Area	Traffic Index	Section Thickness	
		Asphalt Concrete (inches)	Aggregate Base (inches)
Auto Parking Areas	5	3	7
Pavement Area	**Traffic Index**	**Portland Cement Concrete (inches)**	**Aggregate Base (inches)**
Proposed Concrete Pavement (min f'c = 4,500psi)	5	4	4

The upper 24 inches of pavement subgrade should be moisture conditioned to above optimum moisture content and compacted to a minimum of 95 percent relative compaction[3]. Aggregate base or crushed miscellaneous base should conform to Caltrans requirements and should be moisture conditioned to within 2 percent of optimum moisture content prior to being compacted to a minimum of 95 percent relative compaction.

The final structural pavement section design should be based on the traffic indices provided by the project traffic engineer and R-value test results performed on actual subgrade soils in-place at completion of site grading.

6.6 Expansive Soil Considerations

Moisture-sensitive soils swell or shrink when the moisture content of the soil changes. A soil moisture content can change through cyclic wet/dry weather cycles, variations in the groundwater level, installation of irrigation systems, change in landscape plantings, and changes in site grading. Leaking utilities can also drastically change soil moisture content. Based on the plasticity indices of the silt and clay soils, the expansion potential of the fine-grained soils at the site is low. The Atterberg limits and expansion index for the soils tested are summarized below. A copy of the laboratory results is provided in Appendix C.

Table 4 – Plasticity Index & Swell Tests Results

Boring	Sample No.	Depth (feet)	Soil Type	Corrected Expansion Index	LL (%)	PL (%)	PI (%)
LB-1 & LB-2	S-1	5	CL	21	-	-	-
LB-2	S-1	5	CL	-	27	14	13
LB-2	S-5	20	CL	-	33	16	17

[3] Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material, as determined by the ASTM D1557 laboratory compaction.

6.7 Corrosion Considerations

Chemical analyses of select samples are summarized below.

Table 5 – Soil Corrosion Test Results

Sample	Depth (feet)	Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
LB-1 (B-1)	0 - 5	2,043	8.3	43	27

Based on the minimum resistivity, and pH results the soil at these sampled location and depth is considered moderately corrosive to ferrous metals (Romanoff, 1957). A corrosion expert should be consulted during the design phase for the most economical and effective corrosion protection if ferrous (metals) site utilities are required. Based on the soluble sulfate exposure, concrete can be designed as exposure class S0. No special recommendations to concrete mix design are necessary at this time. Concrete should have a minimum specified compressive strength (f'c) of 2,500-psi and may be used for foundations, beams, and slabs (ASTM C150). A copy of the corrosion results is provided in Appendix C.

Confirmatory corrosion testing of the subgrade soils upon completion of site grading should be performed to confirm the applicability of the pavement section recommendations above.

6.8 Stormwater Infiltration

The Site is generally underlain by clay and poorly graded sand with varying amounts of gravel, cobbles, and silt. Based on our evaluation of the soils underlying the site and the laboratory test results, we preliminarily conclude that stormwater infiltration into the fill and upper clays of the fan deposits is generally not feasible at the site. However, it could be possible to infiltrate into the sand, which was encountered at an approximate depth of seven feet bgs. If dry wells are used, they should be minimum of eight feet away from building foundations.

It is estimated that the clay layers will have low infiltration rates while the sand layers will have high infiltration rates. According to the Caltrans Infiltration Basin Design Guidance, typical infiltration rates, including a factor of safety of 4, for a clay material can be up to 0.1 inches per hour, and between ½ to 2 inches per hour for sands. The bulk samples collected during drilling were sufficiently fine-grained such that the Hazen formula, which empirically correlates permeability and grain size, could not be applied.

The infiltration rates and feasibility provided herein should be confirmed based on field testing (i.e. percolation tests or infiltration tests) once location of stormwater infiltration design, locations, and plan depths have been selected. LANGAN should also review the stormwater infiltration design for potential impacts to the proposed foundation design.

7. CONSTRUCTION CONSIDERATIONS

This section presents earthwork recommendations and construction considerations for site preparation and grading.

7.1 Site Preparation

Prior to the commencement of excavation and grading, a meeting should be held at the Site with the Owner, excavation/grading Contractor, Civil Engineer, and Geotechnical Engineer to discuss

the work schedule and geotechnical aspects of the grading. All vegetation and deleterious materials should be disposed of off-site before beginning grading operations.

Any obstruction encountered during demolition and grading should be completely removed including existing utilities. If utility pipes are too deep to be removed economically, they should be filled with cement, sand grout or equivalent material that will prevent future collapse of the pipe.

Disturbance of the near surface clays could result in soft, yielding subgrade, and soils that pump or otherwise yield under construction loading. The contractor should minimize the use of equipment, especially vibration inducing equipment, on top of the clayey soils. Areas observed to pump or yield under construction traffic should be removed and replaced with firm and unyielding compacted soil or stabilized with cement.

Temporary excavations should be performed in accordance with Cal/OSHA. Excavations should not be left open for prolonged periods. If excavations are limited by existing improvements or property lines, special grading techniques, such as slot cuttings or other acceptable design criteria may be required. Under such conditions, specific recommendations should be provided by the geotechnical consultant during review of final grading plan.

7.2 Subgrade Preparation

Prior to fill placement, the subgrade for slab-on-grade and flatwork areas should be scarified to a minimum depth of six inches, moisture conditioned to above optimum moisture content, and compacted to at least 90 percent relative compaction. If the subgrade material contains less than 15 percent fines content (material passing the No. 200 sieve), it should be compacted to at least 95 percent relative compaction.

If compacted flatwork, pavement, or new walkway slab subgrades are disturbed during utility and/or foundation construction, they should be re-rolled prior to flatwork or slab construction.

If soft areas are encountered during site preparation and grading, the soft material should be removed and replaced with either lean concrete or engineered fill. We recommend over excavating soft or firm material to expose stiff and unyielding soil. If firm soil is not encountered after an excavation of 24 inches (except for foundations), a geotextile fabric, such as Mirafi 500X or its equivalent, can be placed at the bottom of the over excavation and the over excavation backfilled with granular material or lean concrete to stabilize it and bridge the soft material.

7.3 Engineered Fill and Compaction Criteria

On-site soils are considered suitable for re-use as engineered fill provided the soils are absent of environmentally unsuitable materials, construction debris, roots and moisture contents can be reduced to between 0 to 3 percent above optimum. Engineered fill material (imported or re used) should be free of organic and other deleterious materials and have a maximum particle size no greater than 3 inches.

We do not anticipate the need to import fill, however, if import fill is needed, the geotechnical consultant should test the proposed fill prior to delivery to the Site. Imported fill should be non-corrosive to concrete and ferrous metals, contain no more than 15 percent passing the no. 200 sieve by dry weight and have a plasticity index less than 7. Grain size distributions, Atterberg limits, maximum dry density, and optimum water content (ASTM D1557) determinations should be made on representative samples of the proposed fill material before being brought to the Site.

Engineered fill should be placed in loose lifts no greater than 8 inches in thickness, moisture conditioned between 0 to 3 percent above of optimum moisture content and compacted to at least 95 percent relative compaction.

Any fill greater than five feet thick or with less than 10 percent fines (passing through the No. 200 sieve) by weight should be placed in loose lifts no greater than 8 inches-thick, moisture conditioned to above optimum moisture content, and compacted to at least 95 percent of the laboratory maximum dry density for its entirety.

All engineered fill placement should be subject to controlled engineering observation by the Geotechnical Engineer or their representative. No fill material should be placed on areas where free water is standing or on surfaces that the geotechnical consultant has not approved.

7.4 Utility Trenches

Utilities can be supported on compacted fill treated with cement or on approved native soils. Soft or wet subgrade might be encountered for trenches in undocumented fill or native soils and the subgrade should be over-excavated by one foot. The over-excavated subgrade can be replaced with gravel and cement or gravel and geotextile fabric.

Bedding material should extend at least 12 inches over the top of the utility unless otherwise required by the utility owner. Where necessary, trench excavations should be shored and braced, in accordance with all safety regulations, to prevent cave-ins. Utility subgrade should be confirmed to be free of standing water, firm, and unyielding prior to placement of bedding material. Utility trenches above pipe bedding should be backfilled in accordance with the recommendations provided herein with either previously excavated soil (if suitable), or with approved imported material.

Fill outside of building footprints or within 2 feet of pavement should be placed in loose lifts no greater than 8 inches in thickness and should be compacted as recommended in Section 7.3.

7.5 Site Drainage

Proper drainage should be maintained at all times. Ponding or trapping of water in localized areas can cause differing moisture levels in the subsurface soil. Drainage should be directed away from the tops of excavations. Erosion protection and drainage control measures should be implemented during periods of inclement weather. During rainfall events, backfill operations may need to be restricted to allow for proper moisture control during fill placement.

8.0 FUTURE STUDIES AND DESIGN AND CONSTRUCTION PHASE SERVICES

The conclusions and preliminary recommendation provide herein are based on project information provided to date and a limited number of borings. As part of schematic design, a design-level geotechnical investigation and evaluation should be provided when structural loads are available. The design-level geotechnical investigation should include additional exploratory borings that extend below the proposed foundation level to confirm the subsurface conditions.

During final design we should be retained to consult with the design team as geotechnical questions arise. Technical specifications and design drawings should incorporate Langan's recommendations. When authorized, Langan will assist the design team in preparing specification sections related to geotechnical issues such as earthwork, shallow foundations, backfill and excavation support. Langan should also, when authorized, review the project plans,

as well as Contractor submittals relating to materials and construction procedures for geotechnical work, to confirm the designs incorporate the intent of our recommendations.

Langan has investigated and interpreted the site subsurface conditions and developed the foundation design recommendations contained herein, and is therefore best suited to perform quality assurance observation and testing of geotechnical-related work during construction. The work requiring quality assurance confirmation and/or special inspections per the Building Code includes, but is not limited to, earthwork, backfill, shallow foundations, and excavation support.

Recognizing that construction observation is the final stage of geotechnical design, quality assurance observation during construction by Langan is necessary to confirm the design assumptions and design elements, to maintain our continuity of responsibility on this project, and allow us to make changes to our recommendations, as necessary. The foundation system and general geotechnical construction methods recommended herein are predicated upon Langan assisting with the final design and providing construction observation services for the Owner. Should Langan not be retained for these services, we cannot assume the role of geotechnical engineer of record, and the entity providing the final design and construction observation services must serve as the engineer of record.

9.0 OWNER AND CONTRACTOR RESPONSIBILITIES

The Contractor is responsible for construction quality control, which includes satisfactorily constructing the foundation system and any associated temporary works to achieve the design intent while not adversely impacting or causing loss of support to neighboring structures. Construction activities that can alter the existing ground conditions such as excavation, fill placement, foundation construction, ground improvement, etc. can also potentially induce stresses, vibrations, and movements in nearby structures and utilities, and disturb occupants of nearby structures. Contractors working at the Site must ensure that their activities will not adversely affect the performance of the structures and utilities, and will not disturb occupants of nearby structures. Contractors must also take all necessary measures to protect the existing structures during construction. By using this report, contractors agree that Langan will not be held responsible for any damage to adjacent structures.

10.0 LIMITATIONS

The conclusions and recommendations provided in this report result from our interpretation of the geotechnical conditions existing at the Site inferred from a limited number of borings. Recommendations provided are contingent upon one another and no recommendation should be followed independent of the others.

Any proposed changes in structures or their locations should be brought to Langan's attention as soon as possible so that we can determine whether such changes affect our recommendations. Information on subsurface strata shown on the logs represents conditions encountered only at the locations indicated and at the time of investigation. If different conditions are encountered during construction, they should immediately be brought to Langan's attention for evaluation, as they may affect our recommendations.

This report has been prepared to assist the owner in their site selection process and is only applicable to the design of the specific project identified. The information in this report cannot be utilized or depended on by engineers or contractors who are involved in evaluations or designs

of facilities (including underpinning, grouting, stabilization, etc.) on adjacent properties which are beyond the limits of that which is the specific subject of this report.

Environmental issues (such as permitting or potentially contaminated soil and groundwater) are outside the scope of this study and should be addressed in a separate evaluation.

11. REFERENCES

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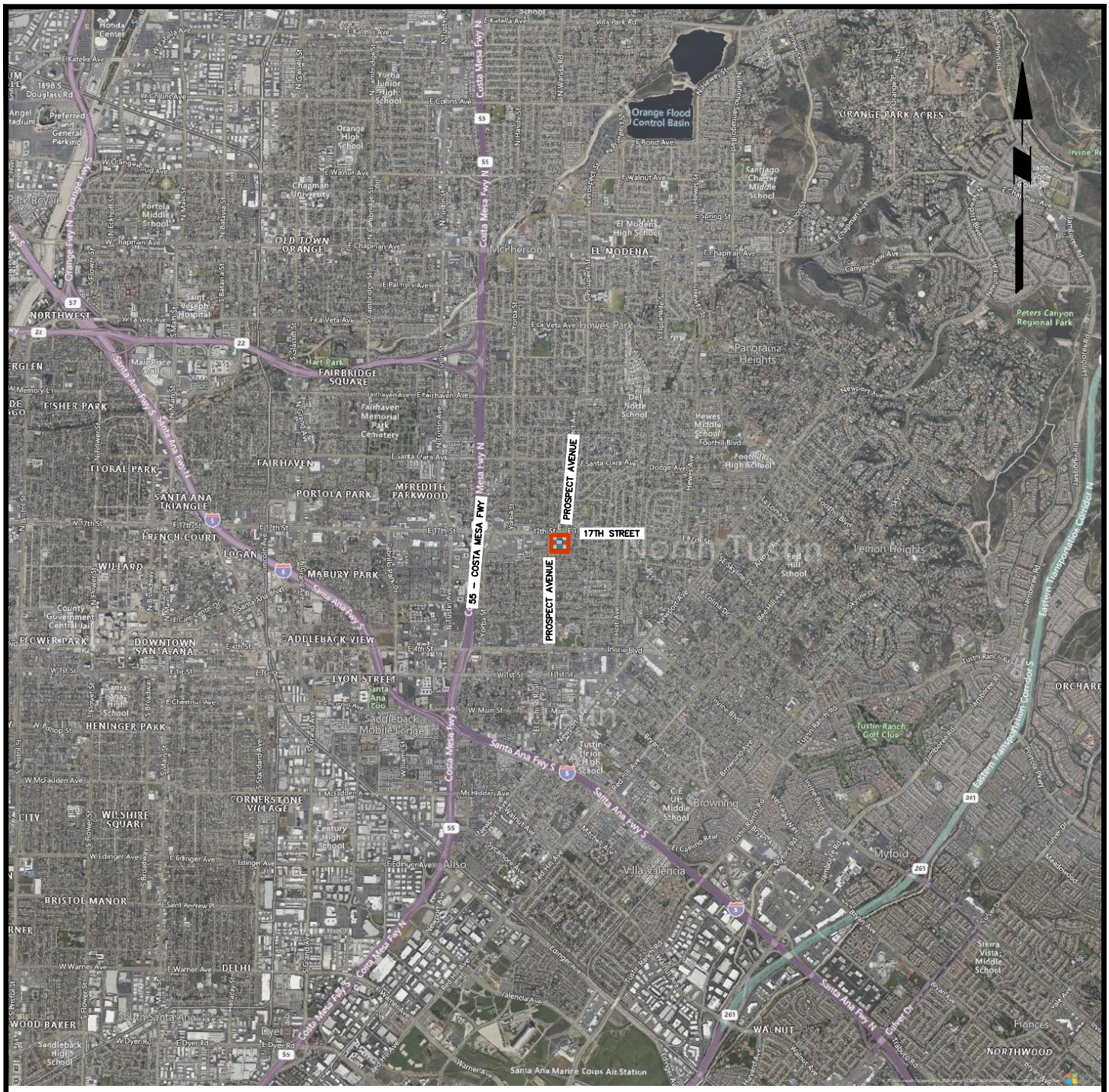
FIGURES



LEGEND:

APPROXIMATE SITE LIMITS

1 0 0.5 1

SCALE: 1 INCH = 1 MILE

NOTES:

1. BACKGROUND REFERENCED FROM MICROSOFT CORPORATION & MAXAR, ACCESSED ON 30 AUGUST 2024 THROUGH AUTOCAD GEOLOCATION SETTINGS. COORDINATE SYSTEM: NAD83 CALIFORNIA STATE PLANES, ZONE VI, US FOOT

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Figure Title
SITE VICINITY MAP

Project No.	700159001
Date	SEPTEMBER 2024
Scale	AS SHOWN
Drawn By	VR

Figure No. **1**

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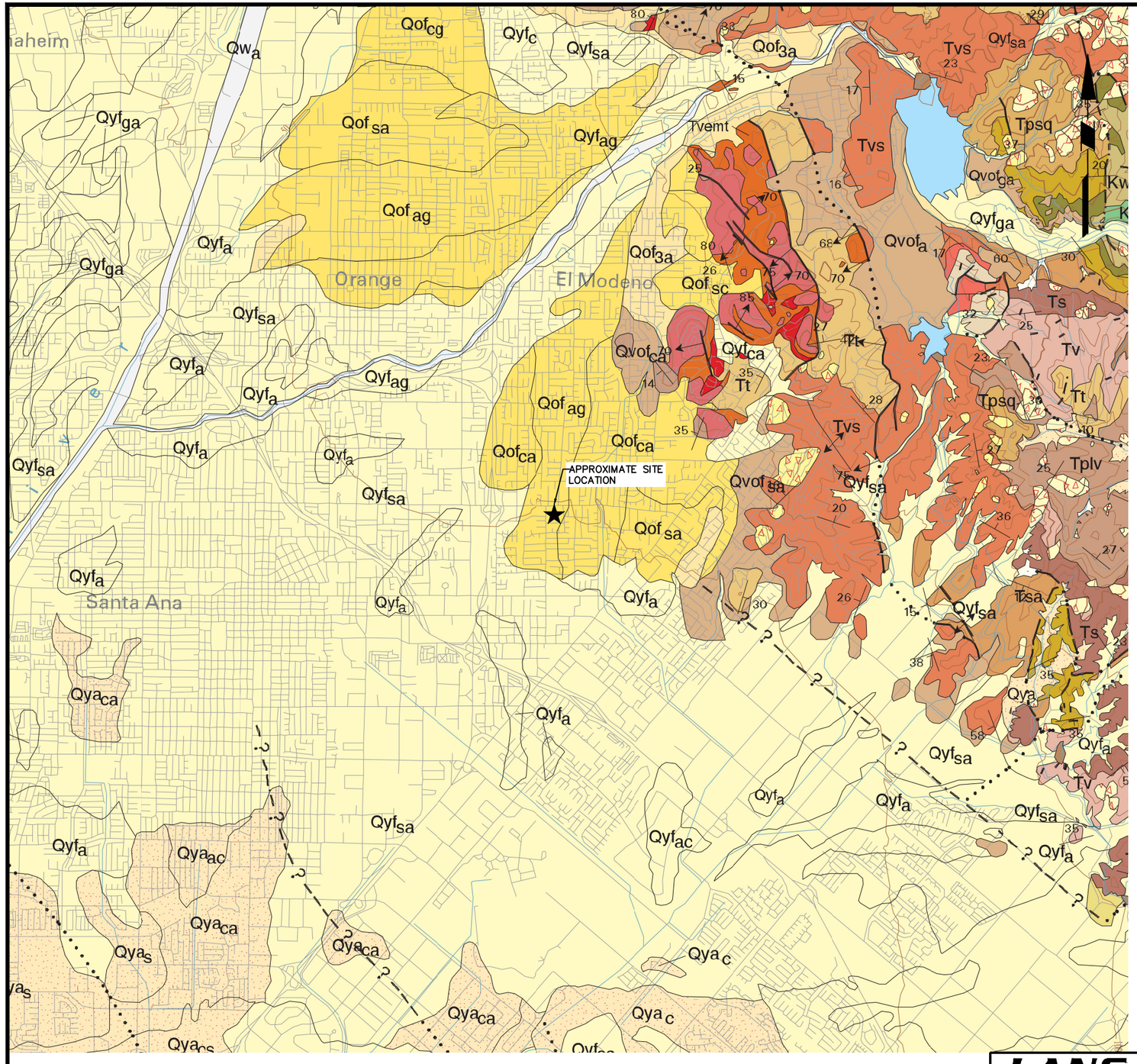

LEGEND:

Qyf	**Young alluvial fan deposits (Holocene and late Pleistocene)**—Gravel, sand, and silt, mixtures, some contain boulders; unconsolidated.
Qya	**Young axial channel deposits (Holocene and late Pleistocene)**—Gravel, sand, and silty alluvium; gray, unconsolidated.
Qof	**Old alluvial fan deposits (late to middle Pleistocene)**—Sandy alluvium; reddish brown, indurated, surface of most fans slightly dissected.
Qvof	**Very old alluvial fan deposits (middle to early Pleistocene)**—Sandy alluvium; reddish-brown, well-indurated, fan surfaces well-dissected.
Tvs	**Vaqueros and Sespe Formations, undifferentiated (early Miocene, Oligocene, and late Eocene)**—Interbedded sandstone and conglomerate; marine and nonmarine
Tt	**Topanga Formation (middle Miocene)**—Marine sandstone, siltstone, and locally conglomerate.
Tplv	**La Vida Member (Miocene)**—Predominately siltstone interbedded with some sandstone
Tpsq	**Soquel Member (Miocene)**—Predominately sandstone and siltstone. Massive to well bedded. Contains some pebbly sandstone beds
Tv	**Vaqueros Formation (early Miocene, Oligocene, and late Eocene)**—Sandstone and sandy siltstone; massive- to thick-bedded, marine
Ts	**Sespe Formation (early Miocene, Oligocene, and late Eocene)**—Conglomeratic sandstone and clayey and silty sandstone; varied colored, poorly defined massive- to thick-beds, nonmarine
Tsa	**Santiago Formation (middle Eocene)**—Sandstone and conglomerate, marine and nonmarine
Tvem	**El Modeno Volcanics (middle Miocene)**—Basaltic and andesitic, tuffaceous extrusive rocks, and intrusive rocks. Includes:
Tvema	**Andesitic volcanic rocks**—Extrusive flow rocks of primarily andesitic composition
Tvemt	**Tuff and tuff breccia**—Clastic volcanic rocks, primarily tuff and tuff breccia. Restricted
Tvemb	**Basalt**—Extrusive flow rocks, mainly basalt composition. Restricted occurrence northwestern Santa Ana Mountains
Tsis / Tsi / Tsicg	**Silverado Formation (Paleocene)**—Sandstone, siltstone, and conglomerate; nonmarine and marine. Much of unit is thoroughly weathered. Basal conglomerate (Tsicg) and Serrano clay (Tsis) are subdivided locally
$Kwps_1$ / Kwps	**Williams Formation (Late Cretaceous)**—Feldspathic sandstone, pebbly sandstone, and conglomeratic sandstone; chiefly white and brown hues, poorly sorted, massive-bedded, very resistant, cliff-forming. Marine. Includes:
	Pleasants Sandstone Member—White to very pale colored feldspathic marine sandstone. Includes ($Kwps_1$) consisting of coarse-grained conglomeratic sandstone

NOTES:

1. BACKGROUND REFERENCED FROM MAP TITLED "PRELIMINARY DIGITAL GEOLOGIC MAP OF THE SANTA ANA 30'X60' QUADRANGLE, SOUTHERN CALIFORNIA" BY D.M. MORTON, DATED 2004. ACCORDING TO THE ACCOMPANYING REPORT, "WHERE KNOWN, GRAIN SIZE IS INDICATED ON THE MAP BY A SUBSCRIPTED LETTER OR LETTERS FOLLOWING THE UNIT SYMBOLS AS FOLLOWS: lg, LARGE BOULDERS; b, BOULDER; g, GRAVEL; a, ARENACEOUS; s, SILT; c, CLAY" AND "MULTIPLE LETTERS ARE USED FOR MORE SPECIFIC IDENTIFICATION OR FOR MIXED UNITS".

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SCALE: 1 INCH = 1 MILE

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Figure Title
GEOLOGIC MAP

Project No.	700159001
Date	SEPTEMBER 2024
Scale	AS SHOWN
Drawn By	VR

Figure No. **2**

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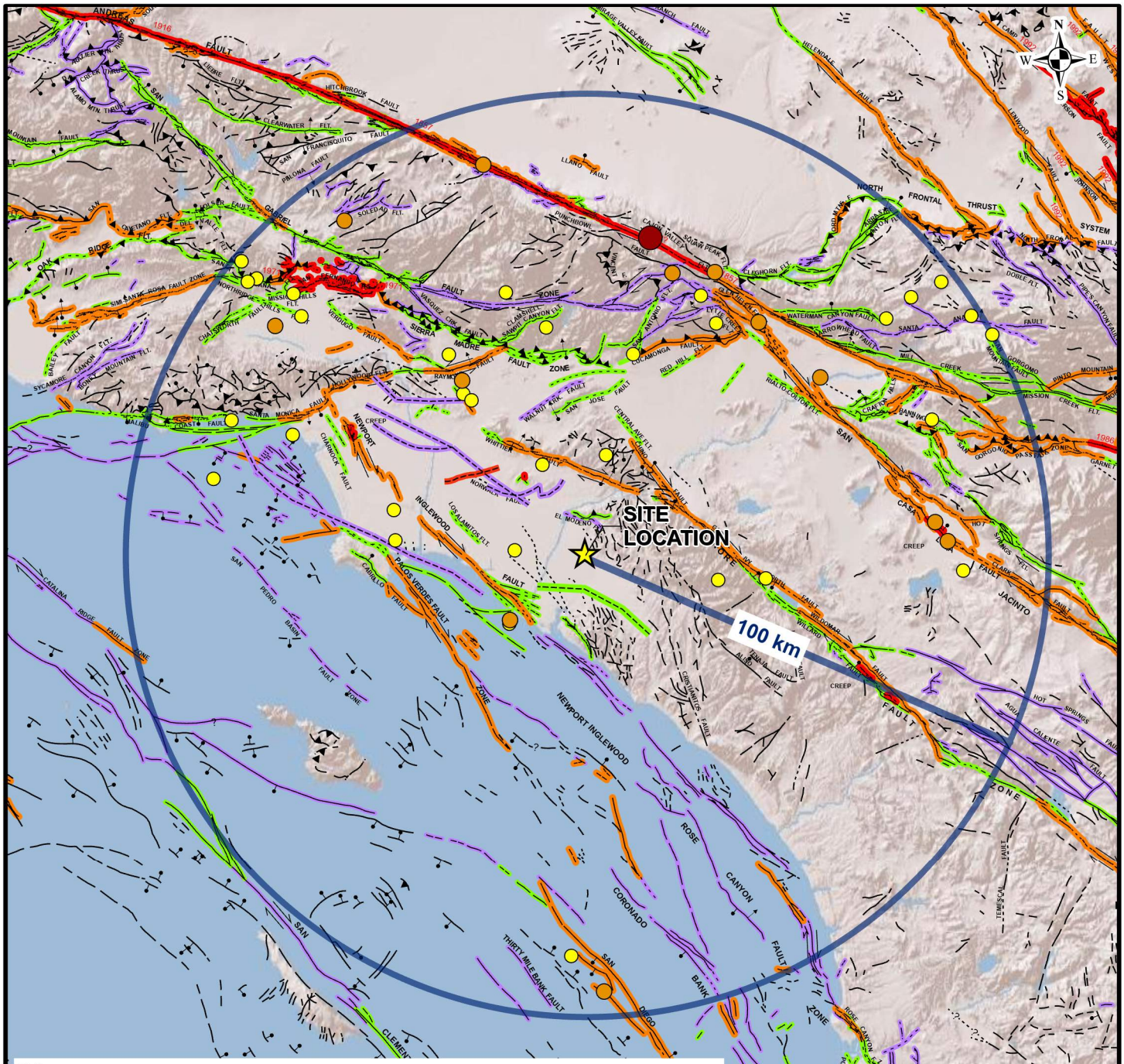
Filename: \\langan.com\data\IRV\data0\700159001\Project Data_Discipline\Geotechnical\CAD\700159001 - Geotech Figures.dwg Date: 9/6/2024 Time: 16:57 User: vramirez Style Table: Langan.stb Layout: Geologic Map



Notes:
1. Base figure reproduced from Jennings, C.W., and Bryant, W.A., 2010, Fault activity map of California: California Geological Survey Geologic Data Map No. 6, map scale 1:750,000.
2. Shaded relief basemap is provided through Langan's ESRI ArcGIS software licensing and ArcGIS online developed by ESRI using GTOPO30, Shuttle Radar Topography Mission (SRTM) and National Elevation Data (NED) data from USGS.
3. Refer to "An Explanatory Text to Accompany the Fault Activity Map of California" compiled and interpreted by Jennings, C.W. and Bryant, W.A., digital preparation by Patel, M., Sander, E., Thompson, J., Wanish, B., and Fonseca, M., for additional fault information.
4. Quaternary-aged faults not included on the 2010 CGS Fault Activity Map have been recreated from the USGS Quaternary Faults Map.
5. Earthquakes queried within 100 km of site location with a magnitude of 5+ from 01/01/1800 to present, from the ANSS Comprehensive Earthquake Catalog (ComCat), downloaded 09/03/2024.
6. Refer to Figure 3B for Legend.

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Figure Title
MAP OF MAJOR FAULTS AND EARTHQUAKE EPICENTERS

Project No.	700159001
Date	SEPTEMBER 2024
Scale	1 inch = 20 miles
Drawn By	AC

Figure
3A

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LEGEND:

Site Location

Fault Age

- Historic
- Holocene
- Late Quaternary
- Early Quaternary
- Pre-Quaternary Fault
- 100 km Search Radius

Earthquake Epicenter

- Magnitude 5.0 to 5.9
- Magnitude 6.0 to 6.9
- Magnitude 7.0 to 7.4
- Magnitude 7.5 to 8.0

Fault Symbols

- Bar and ball on downthrown side (relative or apparent).
- Relative or apparent direction of lateral movement.
- Direction of dip.
- Low angle fault (barbs on upper plate). Fault surface generally dips less than 45° but locally may have been subsequently steepened.
- 491 — Numbers refer to annotations listed in the appendices of the accompanying report.
- Structural discontinuity (offshore) separating differing Neogene structural domains.
- Brawley Seismic Zone.

Fault Classification

Fault along which historic (last 200 years) displacement has occurred and is associated with one or more of the following:
(a) a recorded earthquake with surface rupture. (Also included are some well-defined surface breaks caused by ground shaking during earthquakes, e.g. extensive ground breakage, not on the White Wolf fault, caused by the Arvin-Tehachapi earthquake of 1952). The date of the associated earthquake is indicated. Where repeated surface ruptures on the same fault have occurred, only the date of the latest movement may be indicated, especially if earlier reports are not well documented as to location of ground breaks.
(b) fault creep slippage - slow ground displacement usually without accompanying earthquakes.
(c) displaced survey lines.

1906 ▶ / 1906 ▷ — A triangle to the right or left of the date indicates termination point of observed surface displacement. Solid red triangle indicates known location of rupture termination point. Open black triangle indicates uncertain or estimated location of rupture termination point.

▶1906◀ — Date bracketed by triangles indicates local fault break.

1906 — No triangle by date indicates an intermediate point along fault break.

CREEP — Fault that exhibits fault creep slippage. Hachures indicate linear extent of fault creep. Annotation (creep with leader) indicates representative locations where fault creep has been observed and recorded.

1906 / 1906 ■ — Square on fault indicates where fault creep slippage has occurred that has been triggered by an earthquake on some other fault. Date of causative earthquake indicated. Squares to right and left of date indicate terminal points between which triggered creep slippage has occurred (creep either continuous or intermittent between these end points).

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Figure Title: **MAP OF MAJOR FAULTS AND EARTHQUAKE EPICENTERS**

Project No. 700159001
Date SEPTEMBER 2024
Scale N/A
Drawn By AC

Figure 3B

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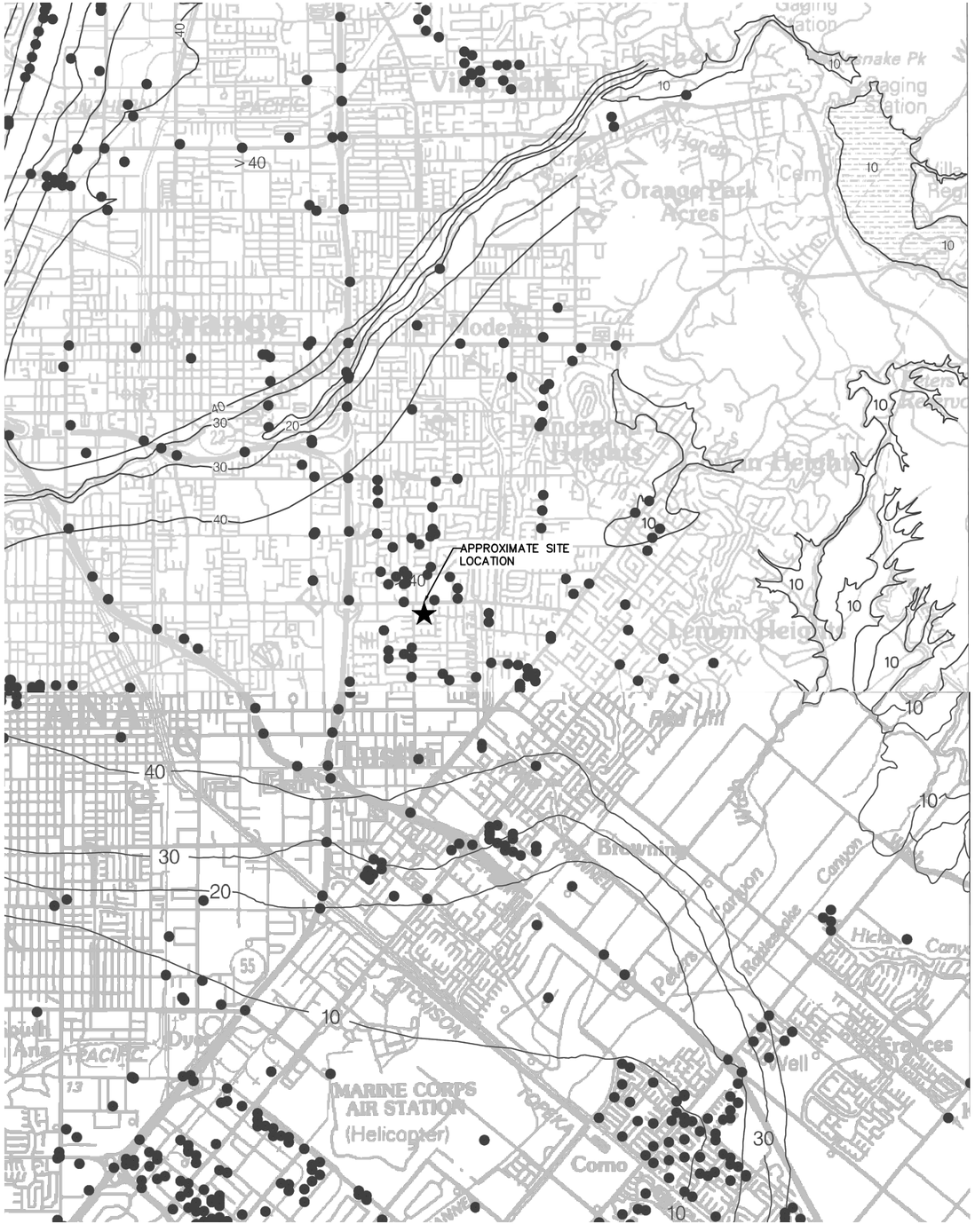

LEGEND:

BOREHOLE SITE

30 DEPTH TO GROUNDWATER IN FEET

NOTES:

1. BACKGROUND REFERENCED FROM MAP TITLED "PLATE 1.3 HISTORICALLY HIGHEST GROUND WATER CONTOURS AND BOREHOLE LOG DATA LOCATIONS, ORANGE 7.5–MINUTE QUADRANGLE, CALIFORNIA" BY THE DEPARTMENT OF CONSERVATION DIVISION OF MINES AND GEOLOGY FROM THE REPORT TITLED "SEISMIC HAZARD ZONE REPORT FOR THE ORANGE 7.5–MINUTE QUADRANGLE, ORANGE COUNTY, CALIFORNIA" DATED 1997 AND MAP TITLED "PLATE 1.2 HISTORICALLY HIGHEST GROUND WATER CONTOURS AND BOREHOLE LOG DATA LOCATIONS, TUSTIN QUADRANGLE" BY THE DEPARTMENT OF CONSERVATION DIVISION OF MINES AND GEOLOGY FROM THE REPORT TITLED "SEISMIC HAZARD ZONE REPORT FOR THE TUSTIN 7.5–MINUTE QUADRANGLE, ORANGE COUNTY, CALIFORNIA" DATED 1998.

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SCALE: 1 INCH = 1 MILE

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Figure Title
HISTORICAL HIGH GROUNDWATER MAP

Project No.	700159001
Date	SEPTEMBER 2024
Scale	AS SHOWN
Drawn By	VR

Figure No. 4

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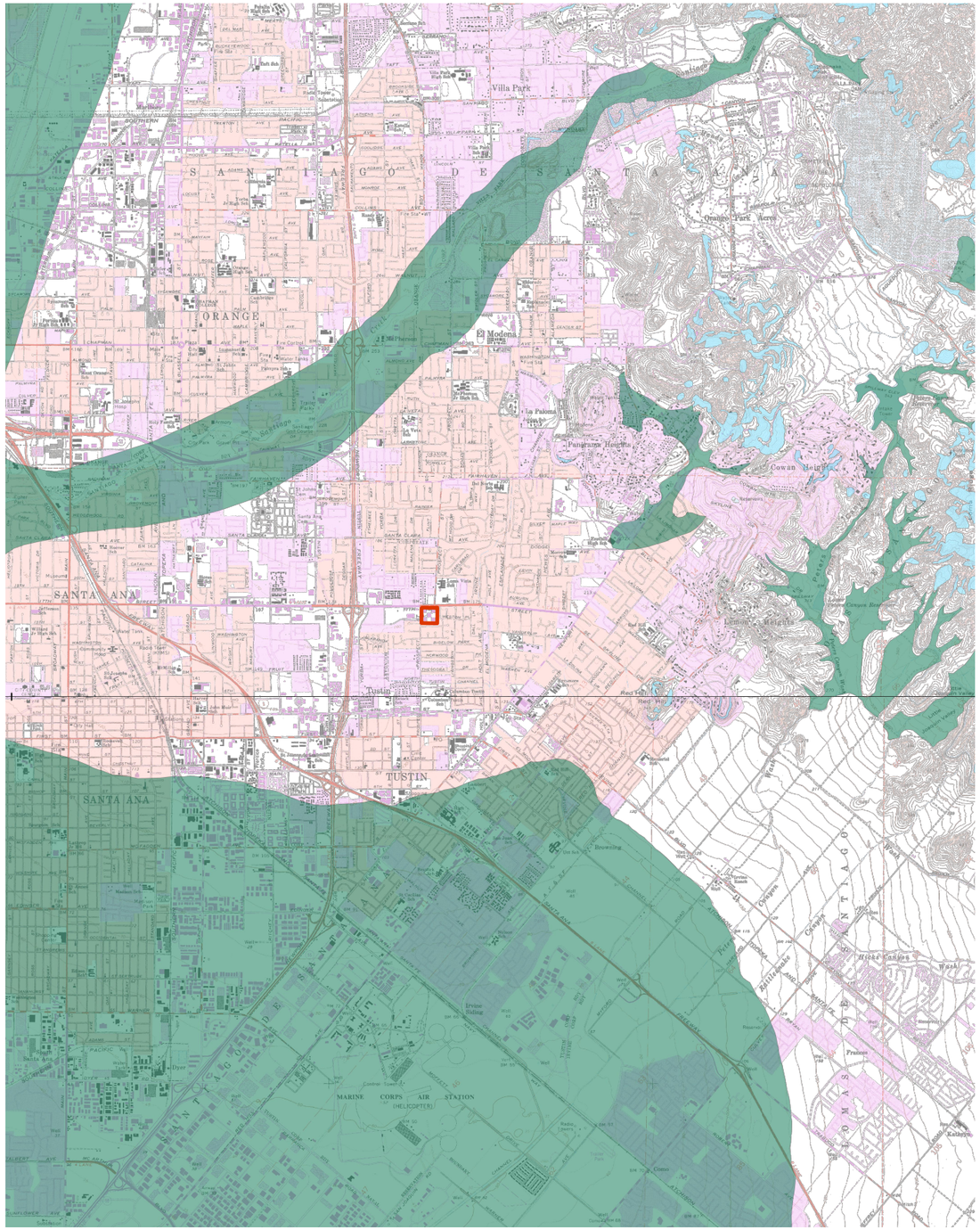
Filename: \\langan.com\data\IRV\data0\700159001\Project Data_Discipline\Geotechnical\CAD\700159001 - Geotech Figures.dwg Date: 9/6/2024 Time: 14:46 User: vramirez Style Table: Langan.stb Layout: Historical High GW Map



LEGEND:

APPROXIMATE SITE LIMITS

SEISMIC HAZARD ZONES

Liquefaction Zones
Areas where historical occurrence of liquefaction, or local geological, geotechnical and ground water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslide Zones
Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

NOTES:

1. BACKGROUND REFERENCED FROM MAP TITLED "EARTHQUAKE ZONES OF REQUIRED INVESTIGATION ORANGE QUADRANGLE" BY CALIFORNIA GEOLOGICAL SURVEY, DATED 15 APRIL 1998, AND MAP TITLED "EARTHQUAKE ZONES OF REQUIRED INVESTIGATION TUSTIN QUADRANGLE" BY CALIFORNIA GEOLOGICAL SURVEY, DATED 17 JANUARY 2001.

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SCALE: 1 INCH = 1 MILE

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PROSPECT AVENUE & 17TH STREET
TUSTIN
ORANGE COUNTY CALIFORNIA

Figure Title
SEISMIC HAZARD ZONES MAP

Project No. 700159001
Date SEPTEMBER 2024
Scale AS SHOWN
Drawn By VR

Figure No. 5

© 2024 Langan

Filename: \\langan.com\data\IRV\data0\700159001\Project Data_Discipline\Geotechnical\CAD\700159001 - Geotech Figures.dwg Date: 9/6/2024 Time: 14:39 User: vramirez Style Table: Langan.stb Layout: Seismic Hazard Zones Map

LEGEND:

APPROXIMATE SITE LIMITS

LB-3
26.5′
APPROXIMATE BORING LOCATION WITH DEPTH IN FEET

NOTES:

1. BACKGROUND REFERENCED FROM MICROSOFT CORPORATION & MAXAR, ACCESSED ON 1 SEPTEMBER 2024 THROUGH AUTOCAD GEOLOCATION SETTINGS. COORDINATE SYSTEM: NAD83 CALIFORNIA STATE PLANES, ZONE VI, US FOOT
2. BORINGS LB–1 THROUGH LB–3 WERE DRILLED BY MARTINI DRILLING, CORP. ON 9 AUGUST 2024 UNDER THE FULL–TIME OBSERVATION OF A LANGAN FIELD ENGINEER.

80 0 40 80
SCALE: 1 INCH = 80 FEET

LANGAN
Langan CA, Inc.
18575 Jamboree Road, Suite 150
Irvine, CA 92612
T: 949.561.9200 F: 949.561.9201 www.langan.com

Project
PROSPECT AVENUE & 17TH STREET
TUSTIN
ORANGE COUNTY CALIFORNIA

Figure Title
EXPLORATION LOCATION PLAN

Project No.	700159001
Date	SEPTEMBER 2024
Scale	AS SHOWN
Drawn By	VR

Figure No. 6

© 2024 Langan

Filename: \\langan.com\data\IRV\data0\700159001\Project Data_Discipline\Geotechnical\CAD\700159001 - Geotech Figures.dwg Date: 9/6/2024 Time: 14:53 User: vramirez Style Table: Langan.stb Layout: Exploration Location Plan

APPENDIX A
USGS ANSS Earthquake Catalog

TABLE A.1 - USGS ANSS EARTHQUAKE CATALOG SEARCH RESULTS

Date [1]	Latitude [1]	Longitude [1]	Approximate Magnitude [1]	Magnitude Type [1]	Approximate Distance from Site (km) [2]
3/29/2014	33.9325	-117.915833	5.1	mw	21
7/29/2008	33.9485	-117.766333	5.44	mw	22
10/16/1999	34.24	-117.04	5.6	mb	90
3/20/1994	34.231	-118.475	5.24	ml	80
1/29/1994	34.306	-118.579	5.06	ml	93
1/17/1994	34.34	-118.614	5.2	ml	97
1/17/1994	34.275	-118.493	5.89	ml	84
1/17/1994	34.213	-118.537	6.7	mw	83
6/28/1992	34.162	-116.852	5.53	ml	100
6/28/1991	34.27	-117.993	5.8	mw	59
2/28/1990	34.144	-117.697	5.51	ml	44
12/3/1988	34.151	-118.13	5.02	ml	52
10/4/1987	34.074	-118.098	5.25	ml	43
10/1/1987	34.061	-118.079	5.9	mw	41
7/13/1986	32.971	-117.874	5.45	ml	88
1/1/1979	33.9165	-118.687167	5.21	ml	82
2/9/1971	34.416	-118.37	5.3	mh	89
2/9/1971	34.416	-118.37	5.8	mh	89
2/9/1971	34.416	-118.37	5.8	mh	89
2/9/1971	34.416	-118.37	6.6	mw	89
9/12/1970	34.2548333	-117.534333	5.22	ml	61
9/23/1963	33.7036667	-116.938167	5.29	ml	82
8/29/1943	34.268	-116.967833	5.28	ml	97
11/14/1941	33.7906667	-118.263667	5.12	ml	41
5/31/1938	33.6993333	-117.511167	5.23	ml	29
3/11/1933	33.85	-118.266	5	ml	42
3/11/1933	33.6238333	-118.001167	5.29	mh	22
3/11/1933	33.7666667	-117.985	5.02	mh	15
3/11/1933	33.6308333	-117.9995	6.4	mw	22
8/31/1930	34.03	-118.643	5.25	ms	82
1/16/1930	34.2	-116.9	5.1	uk	98
1/16/1930	34.2	-116.9	5.25	ms	98
8/4/1927	34	-118.5	5.3	uk	68
7/23/1923	34.089	-117.259	6.21	mw	64
6/6/1918	33.8	-117	5	ml	76
4/21/1918	33.762	-116.972	6.7	mw	78
5/15/1910	33.7	-117.4	5.3	mw	39
5/13/1910	33.7	-117.4	5	ml	39
4/11/1910	33.7	-117.4	5	ml	39
9/20/1907	34.2	-117.1	5.3	mw	83
12/15/1899	33.8	-117	6.7	mw	76
7/22/1899	34.3	-117.5	6.36	mw	67

Date [1]	Latitude [1]	Longitude [1]	Approximate Magnitude [1]	Magnitude Type [1]	Approximate Distance from Site (km) [2]
7/22/1899	34.2	-117.4	5.9	ml	63
7/30/1894	34.3	-117.6	6.2	mw	63
4/4/1893	34.3	-118.6	5.8	ml	94
6/14/1892	34.2	-117.5	5.5	ml	57
8/28/1889	34.2	-117.9	5.6	ml	50
12/19/1880	34	-117	5.9	ml	80
12/16/1858	34.2	-117.4	6	ml	63
1/17/1857	34.52	-118.04	6.3	mw	87
7/11/1855	34.1	-118.1	6	ml	46
12/8/1812	34.37	-117.65	7.5	mw	70
11/22/1800	32.9	-117.8	6.3	mw	95

Notes:

1. The listed Earthquake Catalog Search results were obtained from USGS ANSS website on 1 September 2024.

2. Earthquake Catalog search results include earthquake events within 100 km of the Site with magnitudes of 5.0 or greater since 1800.

APPENDIX B
LANGAN Boring Logs

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Log of Boring **LB-1** Sheet 1 of 3

Project: Prospect Avenue & 17th Street		Project No.: 700159001	
Location: Tustin, California		Elevation and Datum: 163.1 (NAVD88)	
Drilling Company: Martini Drilling Corporation		Date Started: 8/9/2024	Date Finished: 8/9/2024
Drilling Equipment: CME 75 Truck Mounted Drill Rig		Completion Depth: 51.5 ft	Rock Depth: Not Encountered
Size and Type of Bit: 8-inch O.D. Hollow Stem Auger		Number of Samples: Disturbed 11	Undisturbed 0 / Core 0
Casing Diameter (in): N/A	Casing Depth (ft): N/A	Water Level (ft.): First ▽ N/A	Completion ▼ N/A / 24 HR. ▼ N/A
Casing Hammer: N/A	Weight (lbs): N/A / Drop (in): N/A	Drilling Foreman: Jeff Fraizer	
Sampler: 2-inch O.D. Split Spoon & 3-inch O.D. California Modified		Field Engineer: Vanessa Ramirez	
Sampler Hammer: Automatic	Weight (lbs): 140 / Drop (in): 30		

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+163.1							10 20 30 40	
	+162.8		0						
	+162.4	4 inches of Asphalt Concrete							
		4 inches of Aggregate Base	1						
		Artificial Fill (af)	2						
		Brown to dark brown , CLAY, (CL), moist.	3						
	+159.1		4						
		Old Alluvial Fan Deposits (Qof)	5						EI = 21, See Appendix C
		Medium stiff, brown to dark brown, CLAY, some fine to coarse gravel, some fine to coarse sand, (CL), moist.	6	S-1	CR	18	4 9 8	• 17	
	+156.1		7						
		Dense, grayish, fine to coarse SAND with gravel, some cobbles, (SP), moist.	8	S-2	SS	12	10 28 26	• 54	
			9						
		Dense, grayish to brown, fine to coarse SAND with gravel, (SP), moist.	10						Rig chattering from 10 to 15 feet of drilling.
			11	S-3	SS	10	17 23 19	• 42	
	+150.1		12						
		Very stiff, brown, CLAY, some fine sand, (CL), moist.	13						
			14						
			15						
			16	S-4	SS	18	4 12 7	• 19	
	+145.1		17						
			18						
			19						
			20						

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Log of Boring **LB-1** Sheet 2 of 3

Project	Project No.
Prospect Avenue & 17th Street	700159001
Location	**Elevation and Datum**
Tustin, California	Approx. el. 163.1 (NAVD 88)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+143.1	Medium dense, grayish to brown, fine to coarse SAND with gravel, some silt, (SP), moist.	20	S-5	CR	18	13 18 20	38	
			21						
			22						
			23						
			24						
		Medium dense to dense, brown, fine to coarse SAND with gravel, some cobbles , (SP), moist.	25	S-6	CR	18	29 40 19	59	
			26						
			27						
			28						
			29						
		Very dense, grayish to brown, fine to coarse SAND with gravel, (SP), moist.	30	S-7	SS	12	7 10 50/4"	50/4"	
			31						
			32						
			33						
			34						
		Dense, light gray to brown, fine to coarse SAND with gravel, (SP), moist.	35	S-8	SS	18	15 23 19	42	
			36						
			37						
			38						
			39						
		Dense, grayish white to brown, fine to coarse SAND with gravel, (SP), moist.	40	S-9	SS	18	13 22 25	47	
			41						
			42						
			43						
			44						
			45						

N-Value scale: 10 20 30 40

Template: Log-BH; Strip: BH-GEO no line; Printed on 09/05/2024

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Log of Boring **LB-1** Sheet 3 of 3

Project	Project No.
Prospect Avenue & 17th Street	700159001
Location	**Elevation and Datum**
Tustin, California	Approx. el. 163.1 (NAVD 88)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+118.1	Very dense, grayish white to brown, fine to coarse SAND, trace fine gravel, (SP), moist.	45	S-10	SS	13	26 35	61	
			46						
			47						
			48						
			49						
		Very dense, grayish white to brown, fine to coarse SAND with gravel, (SP), moist.	50	S-11	SS	12	20 21 31	52	
	+111.6		51						
		End of Boring at 51.5ft.	52						End of boring. No groundwater encountered. Boring was backfilled with cement grout using the tremie method. Surface was patched with quickset concrete.
		DD = Dry Density pcf = pounds per cubic foot MC = Moisture Content EI = Expansion Index LL = Liquid Limit PI = Plasticity Index	53						
			54						
			55						
			56						
			57						
			58						
			59						
			60						
			61						
			62						
			63						
			64						
			65						
			66						
			67						
			68						
			69						
			70						

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Log of Boring **LB-2** Sheet 1 of 2

Project: Prospect Avenue & 17th Street		Project No.: 700159001	
Location: Tustin, California		Elevation and Datum: 162.1 (NAVD88)	
Drilling Company: Martini Drilling Corporation		Date Started: 8/9/2024	Date Finished: 8/9/2024
Drilling Equipment: CME 75 Truck Mounted Drill Rig		Completion Depth: 26.5 ft	Rock Depth: Not Encountered
Size and Type of Bit: 8-inch O.D. Hollow Stem Auger		Number of Samples: Disturbed 6	Undisturbed 0 / Core 0
Casing Diameter (in): N/A	Casing Depth (ft): N/A	Water Level (ft.): First ▽ N/A	Completion ▼ N/A / 24 HR. ▼ N/A
Casing Hammer: N/A	Weight (lbs): N/A / Drop (in): N/A	Drilling Foreman: Jeff Fraizer	
Sampler: 2-inch O.D. Split Spoon & 3-inch O.D. California Modified		Field Engineer: Vanessa Ramirez	
Sampler Hammer: Automatic	Weight (lbs): 140 / Drop (in): 30		

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+162.1		0						
	+161.8								
	+161.5	3 inches of Asphalt Concrete							Collected bag sample from 0.5 to 5 feet. At 0.5 to 5 feet: Sieve analysis, % Passing #200 = 45, see Appendix C
		4 inches of Aggregate Base	1						
		Artificial Fill (af)							
		Light brown to brown, clayey fine to coarse SAND, trace cobbles, (SC), moist.	2						
	+158.6		3						
		Old Alluvial Fan Deposits (Qof)	4						
		Dark brown, silty CLAY, (CL), moist.							
		soft to medium stiff, brown to dark brown, CLAY, some fine to coarse gravel, some fine to coarse sand, (CL), moist.	5	S-1	CR	18	2 3 7	• 10	DD = 114 pcf, MC = 13%, LL = 27, & PI = 13, see Appendix C
	+155.1		6						
		Medium dense, grayish to brown, fine to coarse SAND with silt and gravel, trace cobbles, (SW-SM), moist.	7	S-2	SS	10	7 12 8	• 20	Rig chattering from 7.5 to 10 feet of drilling. Sieve analysis, % Passing #200 = 6, see Appendix C
			8						
			9						
		Dense, light brown to brown, fine to coarse SAND with silt and gravel, (SW-SM), moist.	10	S-3	SS	10	10 15 23	38 •	
			11						
			12						
			13						
			14						
		Medium dense, brown to dark brown, fine to coarse SAND with silt and gravel, some cobbles, trace clay, (SW-SM), moist.	15	S-4A	CR	18	15 14 22	36 •	
	+146.3		16	S-4B					
		Very stiff , brown, CLAY, trace fine to coarse sand, trace cobbles, (CL), moist.	17						
			18						
			19						
			20						

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Log of Boring **LB-2** Sheet 2 of 2

Project	Project No.
Prospect Avenue & 17th Street	700159001
Location	**Elevation and Datum**
Tustin, California	Approx. el. 162.1 (NAVD 88)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+142.1	Stiff to very stiff, brown, CLAY, trace silt, (CL), moist.	20	S-5	SS	18	4 7 9	• 16	MC = 16.8%, LL = 33, PI = 17, see Appendix C
	+139.1	Dense, grayish to light brown, fine to coarse SAND, some fine to coarse gravel, trace silt, (SP), moist.	25	S-6	SS	12	12 19 12	31 •	
	+135.6	End of Boring at 26.5ft.	27						End of boring. No groundwater encountered. Boring was backfilled with cement grout using the tremie method. Surface was patched with quickset concrete.

DD = Dry Density
pcf = pounds per cubic foot
MC = Moisture Content
EI = Expansion Index
LL = Liquid Limit
PI = Plasticity Index

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Log of Boring **LB-3** Sheet 1 of 2

Project: Prospect Avenue & 17th Street	Project No.: 700159001
Location: Tustin, California	Elevation and Datum: 161.3 (NAVD88)
Drilling Company: Martini Drilling Corporation	Date Started: 8/9/2024 / Date Finished: 8/9/2024
Drilling Equipment: CME 75 Truck Mounted Drill Rig	Completion Depth: 26.4 ft / Rock Depth: Not Encountered
Size and Type of Bit: 8-inch O.D. Hollow Stem Auger	Number of Samples: Disturbed 6 / Undisturbed 0 / Core 0
Casing Diameter (in): N/A / Casing Depth (ft): N/A	Water Level (ft.): First ▽ N/A / Completion ▼ N/A / 24 HR. ▼ N/A
Casing Hammer: N/A / Weight (lbs): N/A / Drop (in): N/A	Drilling Foreman: Jeff Fraizer
Sampler: 2-inch O.D. Split Spoon & 3-inch O.D. California Modified	Field Engineer: Vanessa Ramirez
Sampler Hammer: Automatic / Weight (lbs): 140 / Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks
	+161.3							10 20 30 40	(Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+161.0		0						
	+160.7	3 inches of Asphalt Concrete	1						Collected bag sample from 0.5 to 5 feet. At 0.5 to 5 feet: Sieve analysis, % Passing #200 = 42, see Appendix C
		4 inches of Aggregate Base							
		Artificial Fill (af)	2						
		Tannish-brown, fine to coarse SAND, some cobbles, some silt, (SP), moist.	3						
	+158.3								
		Old Alluvial Fan Deposits (Qof)	4						
		Brown, CLAY, some cobbles, some fine to coarse gravel, trace fine to coarse sand, (CL), moist.							
		Soft to medium stiff, brown, CLAY, some cobbles, some fine to coarse gravel, trace fine sand to medium sand, (CL), moist.	5	S-1	CR	18	3 4 6	10	
	+154.3		6						
		Medium dense, brown, fine to coarse SAND with gravel, some cobbles, (SP), moist.	7						
			8	S-2	SS	4	11 16 19	35	
		Dense, no recovery.	9						
			10	S-3	SS	0	11 22 28	50	Rig chattering from 10 to 15 feet of drilling.
			11						
			12						
			13						
			14						
		Medium dense, light brown, fine to coarse SAND with gravel, some clay, some cobbles, (SP), dry.	15	S-4	CR	6	50	50	
	+143.8		16						
			17						
			18						
			19						
			20						

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Log of Boring **LB-3** Sheet 2 of 2

Project	Project No.
Prospect Avenue & 17th Street	700159001
Location	**Elevation and Datum**
Tustin, California	Approx. el. 161.3 (NAVD 88)

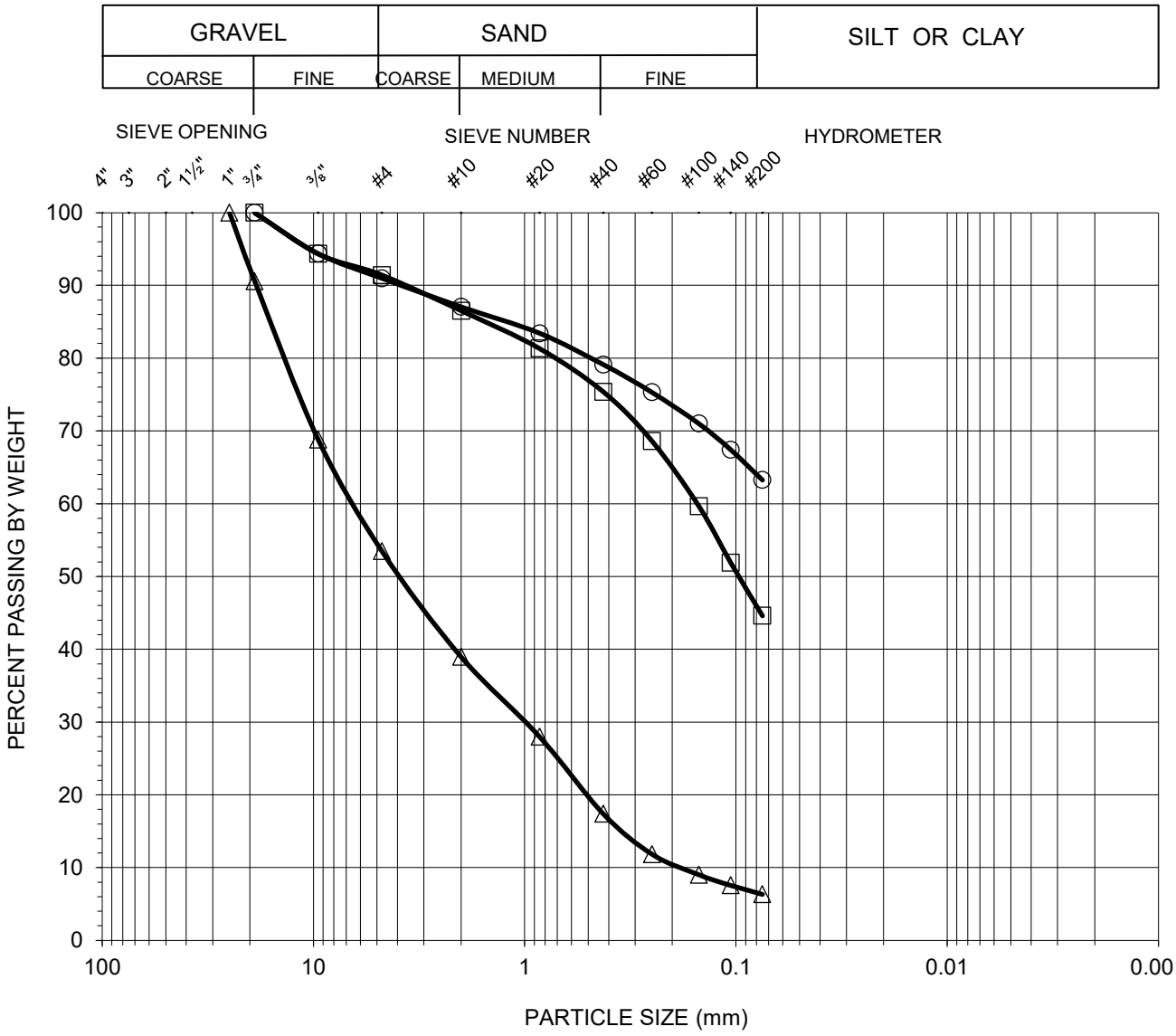
Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+141.3	Hard, brown, CLAY with fine to coarse gravel, some fine to coarse sand, some cobbles, (CL), dry.	20						
			21	S-5	CR	12	22 35 32	67	
			22						
	+138.3		23						
			24						
		Very dense, light gray to brown, fine to coarse SAND, some fine to coarse gravel, trace clay, (SP), dry.	25						
			26	S-6	SS	18	11 30 50/5"	50/5"	
	+134.9	End of Boring at 26.4ft.	27						End of boring. No groundwater encountered. Boring was backfilled with cement grout using the tremie method. Surface was patched with quickset concrete.
		DD = Dry Density pcf = pounds per cubic foot MC = Moisture Content EI = Expansion Index LL = Liquid Limit PI = Plasticity Index	28						
			29						
			30						
			31						
			32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						

APPENDIX C
Laboratory Test Results

AP Engineering and Testing, Inc.
DBE|MBE|SBE
2607 Pomona Boulevard | Pomona, CA 91768
t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com

GRAIN SIZE DISTRIBUTION CURVE
ASTM D 6913

Client Name:	Langan Engineering	Tested by:	SM	Date:	08/22/24
Project Name:	Prospect Ave & 17th Street	Computed by:	JG	Date:	08/23/24
Project No.:	7E+08	Checked by:	AP	Date:	08/23/24



Symbol	Boring No.	Sample No.	Sample Depth (feet)	Percent			Atterberg Limits LL:PL:PI	Soil Type U.S.C.S
				Gravel	Sand	Silt & Clay		
○	LB-1	B-1	0-5	9	28	63	N/A	CL*
□	LB-2	B-1	0-5	9	46	45	N/A	SC*
△	LB-2	S-2	7-5	46	48	6	N/A	SW-SM

*Note: The plasticity is based on visual classification of sample

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GRAIN SIZE DISTRIBUTION CURVE
ASTM D 6913

Client Name:	Langan Engineering	Tested by:	SM	Date:	08/22/24
Project Name:	Prospect Ave & 17th Street	Computed by:	JG	Date:	08/23/24
Project No.:	7E+08	Checked by:	AP	Date:	08/23/24

Symbol	Boring No.	Sample No.	Sample Depth (feet)	Percent			Atterberg Limits LL:PL:PI	Soil Type U.S.C.S
				Gravel	Sand	Silt & Clay		
○	LB-3	B-1	0-5	13	45	42	N/A	SC*

*Note: The plasticity is based on visual classification of sample.

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MOISTURE AND DENSITY TEST RESULTS

ASTM D2216 and ASTM D7263 (Method B)

Client: Langan Engineering
Project Name: Prospect Ave & 17th Street
Project No.: 700159001

AP Lab No.: 24-0847
Test Date: 08/20/24

Boring No.	Sample No.	Sample Depth (ft.)	Moisture Content (%)	Dry Density (pcf)
LB-2	S-1	5	13.0	113.7
LB-2	S-5	20	16.8	NA

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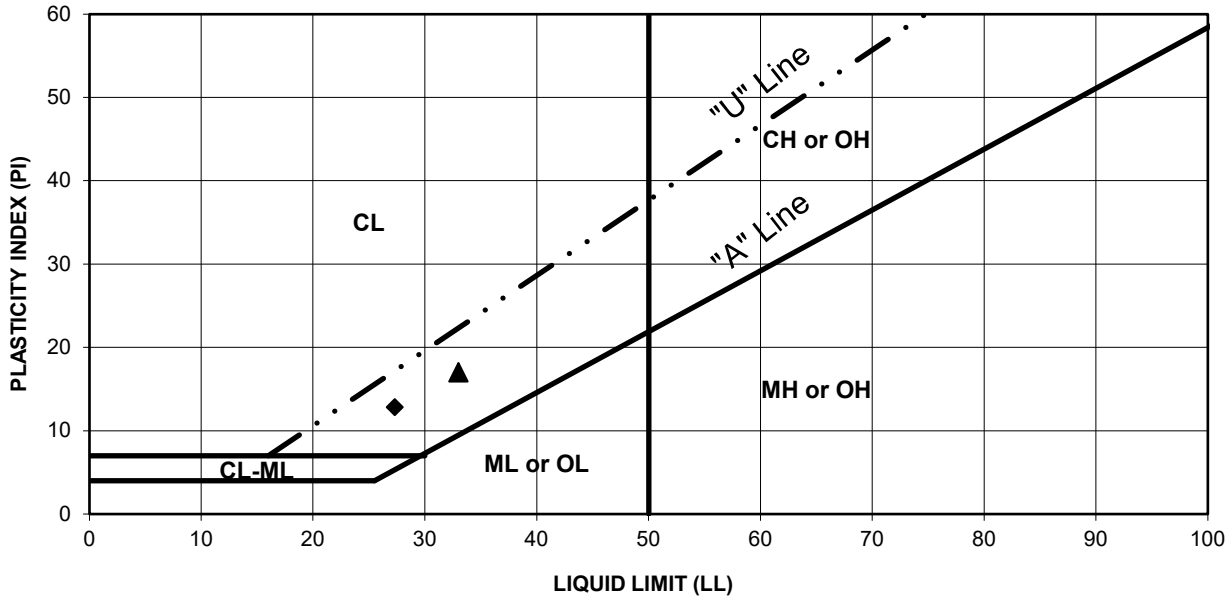
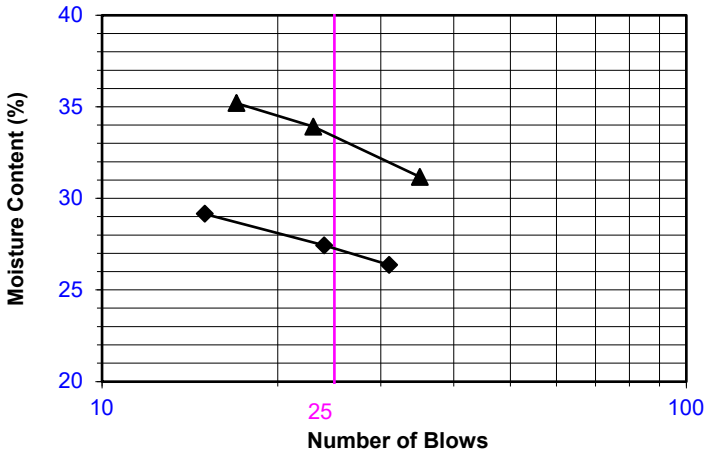
ATTERBERG LIMITS
ASTM D 4318

Client Name:	Langan Engineering	Tested By:	DK	Date:	08/21/24
Project Name:	Prospect Ave & 17th Street	Computed By:	JG	Date:	08/22/24
Project No.:	700159001	Checked By:	AP	Date:	08/23/24



PROCEDURE USED

- ☐ Wet Preparation
- ☒ Dry Preparation
- ☒ Procedure A Multipoint Test
- ☐ Procedure B One-point Test



Symbol	Boring Number	Sample Number	Depth (feet)	LL	PL	PI	Plasticity Chart Symbol
♦	LB-2	S-1	5	27	14	13	CL
▲	LB-2	S-5	20	33	16	17	CL

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EXPANSION INDEX TEST RESULTS

ASTM D 4829

Client Name: Langan Engineering
Project Name: Prospect Avenue & 17th Street
Project No.: 700159001

AP Job No.: 24-0847
Date: 08/21/24

Boring No.	Sample No.	Depth (ft)	Soil Description	Molded Dry Density (pcf)	Molded Moisture Content (%)	Init. Degree Saturation (%)	Measured Expansion Index	Corrected Expansion Index
LB-1& LB-2	S-1	5	Sandy Clay	119.5	7.7	50.8	21	21

ASTM EXPANSION CLASSIFICATION

Expansion Index	Classification
0-20	V. Low
21-50	Low
51-90	Medium
91-130	High
>130	V. High

AP Engineering and Testing, Inc.
DBE|MBE|SBE
2607 Pomona Boulevard | Pomona, CA 91768
t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com

CORROSION TEST RESULTS

Client Name: Langan Engineering
Project Name: Prospect Avenue & 17th Street
Project No.: 700159001

AP Job No.: 24-0847
Date: 08/21/24

Boring No.	Sample No.	Depth (feet)	Soil Description	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
LB-1	B-1	0-5	Sandy Clay	2,043	8.3	43	27

NOTES: Resistivity Test and pH: California Test Method 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

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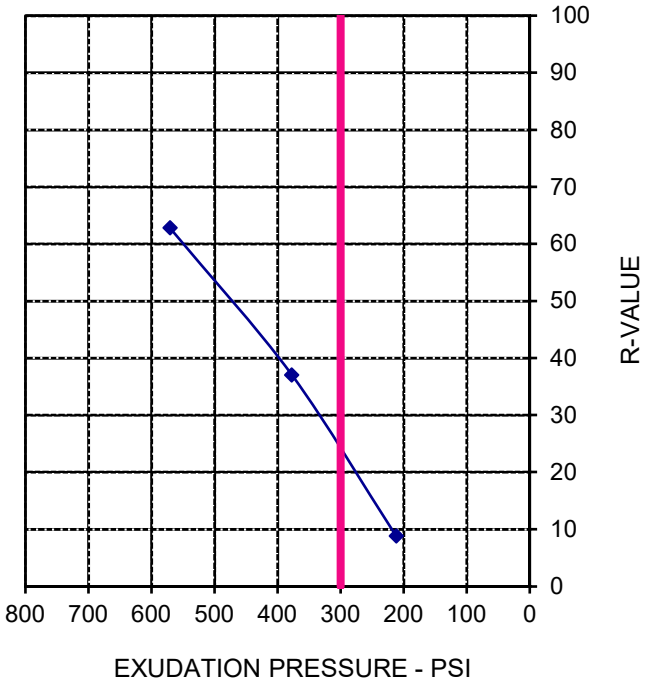
R-VALUE TEST DATA

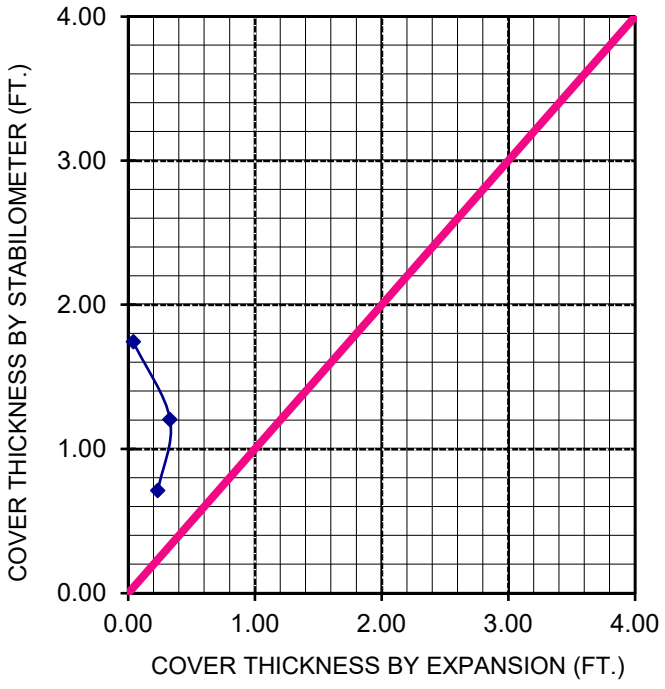
ASTM D2844

Project Name:	Prospect Ave & 17th Street		Tested By:	ST	Date: 08/16/24
Project Number:	700159001		Computed By:	KM	Date: 08/20/24
Source:	LB-1		Checked By:	AP	Date: 08/23/24
Sample No.:	B-1	Depth (ft.): 0-5			
Location:	N/A				
Soil Description:	Sandy Clay				

Mold Number	G	H	I	
Water Added, g	0	-29	-39	
Compact Moisture(%)	16.3	13.3	12.3	
Compaction Gage Pressure, psi	75	275	300	
Exudation Pressure, psi	212	377	570	
Sample Height, Inches	2.5	2.5	2.5	
Gross Weight Mold, g	2920	2932	2916	
Tare Weight Mold, g	1826	1836	1818	
Net Sample Weight, g	1094	1097	1098	
Expansion, inchesx10^{-4}	12	99	70	
Stability 2,000 (160 psi)	57/135	30/80	15/43	
Turns Displacement	4.80	4.25	4.03	
R-Value Uncorrected	9	37	63	
R-Value Corrected	9	37	63	
Dry Density, pcf	114.0	117.3	118.5	
Traffic Index	8.0	8.0	8.0	
G.E. by Stability	1.74	1.20	0.71	
G.E. by Expansion	0.04	0.33	0.23	

R-VALUE	By Exudation:	24
	By Expansion:	*N/A
	At Equilibrium: (by Exudation)	24
Remarks	Gf = 1.34, and 6.1 % Retained on the ¾" *Not Applicable	





NMG Geotechnical, Inc.

February 19, 2025

Project No. 24073-01

To: Kingsbarn Realty Capital
2500 Sand Hill Road, Suite 320
Menlo Park, California 94025

Attention: Mr. John Stack

Subject: Geotechnical Review of Vesting Tentative Tract Map 19390, Cypress Grove Residential Development, Tract 19390, Tustin, California

EXECUTIVE SUMMARY

In accordance with your request and authorization, NMG Geotechnical, Inc. (NMG) has reviewed the Vesting Tentative Tract Map (VTTM) 19390 and the conceptual site plan for the proposed redevelopment, and performed a subsurface investigation for the subject site. The site is located at the southeast corner of the intersection of 17th Street and Prospect Avenue (Figure 1) and is currently an office development. The proposed redevelopment consists of the demolition of the existing office park and construction of 145 new residential homes. The VTTM was prepared by C&V Consulting, Inc. (C&V) and the Conceptual Site Plan was prepared by Kevin L. Crook Architect Inc.

This geotechnical study included a review of background reports and maps, review of a prior preliminary geotechnical report prepared by Langan (2024), field reconnaissance, drilling of three hollow-stem-auger borings, advancement of three cone penetrometer test (CPT) soundings, laboratory testing and geotechnical analysis of the collected data. Our study focused on evaluating the existing geotechnical conditions with respect to the proposed residential development. Information from the prior geotechnical study was also utilized in this study.

The site is underlain by deep Quaternary-aged older alluvial deposits, and prior undocumented fill up to 4 feet thick. The groundwater level is deep (in excess of 50 feet below existing grade). Between 5 and 20 feet, the alluvium consists primarily of damp, fine to coarse grained clayey sand with abundant gravel and cobbles. Below a depth of 20 feet, the alluvium consists of alternating coarse- and fine-grained soils. There are no mapped faults underlying the property and the closest seismically active fault is the Whittier fault located approximately 16.2 km (10.2 miles) to the north. The site is not mapped in a seismic hazard zone for potential liquefaction or earthquake-induced landslides (CDMG, 1997).

The main geotechnical issues impacting the project development include:

- Removal of the existing (undocumented) fill and unsuitable surficial soils to provide a uniform cap of certified engineered fill for the building pads. The demolition of existing structures and utilities may require deeper excavations and could result in additional loose, disturbed soil that will need to be recompacted as compacted fill.
- Deeper utility excavations into the native alluvium will encounter gravels and cobbles which may adversely impact trench stability. Some oversize materials may need to be removed from the site.
- Potential for strong seismic shaking during an earthquake on a regionally active fault.

This report presents our geotechnical findings, conclusions and preliminary recommendations for project planning and preliminary design. We have included a Boring Location Map (Plate 1) which depicts the boring locations by NMG and Langan (2024). The geotechnical boring logs and laboratory test data from our subsurface exploration and Langan are included in Appendices B and C, respectively. Appendix D includes the code-based seismic analysis. Appendix E includes NMG's general earthwork and grading specifications.

The proposed redevelopment of the site is considered geotechnically acceptable. The recommendations in this report are preliminary and final geotechnical recommendations will be provided based on review of the future grading, foundation, and improvement plans.

If you have any questions regarding this report, please contact us. We appreciate the opportunity to provide our services.

Respectfully submitted,

NMG GEOTECHNICAL, INC.

William Goodman, CEG 1577
Principal Geologist

Karlos Markouizos, RCE 50312
Principal Engineer

SHC/DDK/KGM/WG/ad

Email Distribution: Addressee
Ms. Joy Hendricks, C&V Consulting, Inc.

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1.0 INTRODUCTION

1.1 Scope of Work

The purpose of our geotechnical study was to evaluate the existing subsurface conditions in light of the proposed redevelopment at the subject site. Our investigation and this report are based upon our review of the Vesting Tentative Tract Map provided by C&V and the conceptual site plan prepared by Kevin L. Crook Architect Inc.

Our scope of work included the following:

- Background review of available published and unpublished reports and maps (Appendix A).
- Review of available historic aerial photographs and topographic maps pertinent to the site and surrounding area.
- Drilling, logging, sampling, and backfilling of three hollow-stem-auger borings (H-1 to H-3) to depths of approximately 50.8 feet deep below ground surface (bgs). Approximate boring locations are shown on Plate 1, and the boring logs are included in Appendix B.
- Advancement of three CPT soundings (CPT-1 to CPT-2a). Approximate CPT locations are shown on Plate 1, and the CPT logs are included in Appendix B.
- Laboratory testing of relatively undisturbed ring and bulk soil samples. Test results are summarized in Appendix C.
- Geotechnical evaluation and analysis of the compiled data with respect to the proposed redevelopment.
- Preparation of this report including our findings, conclusions, recommendations, and accompanying illustrations.

1.2 Site Location and Existing Conditions

The project site is approximately 8.5 acres and located at the southeast corner of the intersection of Prospect Avenue and 17th Street the City of Tustin, California (Figure 1). There are five existing office buildings (two- and three-story) surrounded by surface parking areas located at 17772, 17862, 17822, 17782, and 17852 17th Street. The site is relatively flat with surface elevations ranging from approximately 162 to 165 feet above mean sea level (msl). The site has existing wet and dry utilities serving the office buildings. The drives and parking lots consist of asphalt cement pavements. There are limited hardscape improvements for the walks and curbs and gutters, etc. The existing landscape includes turf areas, planters, and trees. An existing block wall along the southern and eastern perimeter separates the site from existing single-family residences. We understand the existing walls and street improvements around the perimeter of the site will remain in place.

1.3 Site History

The earliest aerial photographs reviewed were taken in 1946. At that time, the subject site and surrounding areas were being utilized as orchards. The site had one structure in the northeast corner and farming dirt access roads where streets 17th and Prospect would later be constructed. This structure is depicted on topographic maps dating back to 1896. The residential development along the southern perimeter of the site was built between 1952 and 1960. The residential development along the eastern perimeter of the site was constructed between 1960 and 1962. By 1968 the site had been cleared of orchards, and the structure on the northeastern corner of the site was still visible. By 1972 the two current northern office buildings had been constructed, and the central and southern buildings were under construction. An image from 1977 shows all buildings constructed and the site in its current configuration. The site has remained relatively unchanged since 1977.

1.4 Prior Geotechnical Study

Prior to this study, Langan prepared a preliminary geotechnical report for the subject site (Langan, 2024). Langan's field investigation included drilling, logging and sampling of three geotechnical borings to depths ranging from 26.5 to 51.5 feet. Laboratory testing on samples included particle size analysis, moisture content and density, Atterberg limits, expansion index, R-value, and corrosion testing. Boring logs are presented in Appendix B. Laboratory test results are presented in Appendix C.

1.5 Proposed Development

The existing five buildings, asphalt pavement, existing utilities, and local concrete structures will be demolished during the initial phase of the redevelopment of the site. The proposed site will be graded to create new building pads with associated backbone infrastructure, and paved drives/parking areas. The residential development will consist of construction of 62 cluster homes, 83 townhomes, a recreation center, and associated interior roads, sidewalks, and parking areas. Utility and landscape improvements are also proposed for the redevelopment.

We reviewed the current conceptual site plan (dated January 9, 2025) prepared by Kevin L. Crook Architect Inc. The proposed residential buildings will consist of wood-framed three-story structures with enclosed garages. There are 44 surface parking spaces and 290 enclosed garage spaces. The plan also includes common open space, private open space, and a 0.19 acre recreation site.

1.6 Field Investigation

The subsurface exploration was conducted on January 24, 2025. The CPT, and boring locations were marked and cleared with DigAlert as required. Exploration consisted of three CPT soundings, and three hollow-stem-auger borings. The CPTs encountered refusal at 6.6 feet, 7.4 feet, and 10 feet bgs. The hollow-stem-auger borings were advanced 21.4 to 50.8 feet deep. The borings were geotechnically logged and sampled. The CPT and boring logs are included in Appendix B, and the approximate locations are depicted on Plate 1.

The three cone penetration tests (CPT-1 through CPT-2a) were performed by Kehoe Testing and Engineering, Inc. The CPTs use an integrated electronic cone system that measures and records tip resistance, sleeve friction, and friction ratio parameters at 5-cm depth intervals. These explorations were located across the site and encountered fill and alluvial materials with soil behavior types consisting of heterogeneous layers of clays, silts, and silty sands to sands. Due to refusal (on gravels or cobbles) within the upper 10 feet bgs, detailed subsurface CPT data below a depth of 10 feet bgs was not collected.

The hollow-stem-auger borings (H-1 through H-3) were drilled by 2R Drilling. Borings H-2 and H-3 were drilled approximately 20 feet away from Langan's LB-1 and LB-3. Relatively undisturbed soil ring samples were collected using a 2.5-inch-inside-diameter modified California split-spoon sampler. The samplers were driven with a 140-pound hammer, free-falling 30 inches. Most of the ring samples obtained were disturbed due to the significant gravel and cobbles encountered in the borings. Representative bulk samples of onsite soil were collected from the hollow-stem cuttings and used for additional soil identification purposes and laboratory testing. The sampling was used to assess soil types beneath the site as well as to obtain a measure of resistance of the soil to penetration (recorded as blows-per-foot on the geotechnical boring logs). Borings were patched at the surface with concrete and dyed black to match existing pavement.

1.7 Laboratory Testing

The type of laboratory tests performed (including the prior soil testing by Langan) for the onsite soils are listed below. The laboratory tests were conducted on selected bulk soil samples of the existing fill in the upper 5 feet. The direct shear testing was conducted on samples remolded to 90 percent relative compaction. The laboratory test results are presented in Appendix C. In-situ moisture and dry density results are included on the geotechnical boring logs (Appendix B).

- In-situ moisture content and dry density.
- Maximum density and optimum moisture content.
- Grain-size distribution (sieve and/or hydrometer);
- Atterberg Limits;
- Direct shear (remolded);
- Expansion index;
- Maximum density;
- R-Value; and
- Corrosivity

2.0 GEOTECHNICAL FINDINGS

2.1 Geologic Conditions and Earth Units

The subject site is located on the eastern margins of the Los Angeles Basin, within the floodplains of Santiago Creek and the Santa Ana River. The site is located on an area of older alluvial fan material composed primarily of sands and gravels (Morton and Miller, 2006) as shown on Figure 3. The thickness of Quaternary material below the site is approximately 400 feet (CDMG, 1980). The older alluvial material is overlain by a thin veneer of undocumented fill, placed during construction of the current office buildings.

The existing artificial undocumented fill at the site is 3 to 5 feet thick. This material generally consists of brown to dark brown, sandy clay and clayey sand, that is damp to moist, and medium dense/stiff.

The Quaternary-aged older alluvium consists of a heterogeneous mixture of gravels, silts, clays, and sands. The upper 5 to 20 feet of alluvium site is primarily composed of sandy fine to coarse gravel that is damp, and very dense with little to no organics. The consistency of this gravel between each boring suggests the gravel is consistent across the site from depths of 5 to 20 feet and deeper. Between 20 and 50 feet bgs, there are layers of sandy gravels, silts and sandy clays that are damp, and dense to hard.

2.2 Regional Faulting and Seismicity

Faulting: The site is not located within a fault-rupture hazard zone as defined by the Alquist-Priolo Special Studies Zones Act, and no evidence of active faulting was observed during this investigation. Also, based on mapping by the State (California Geological Survey, 2010), there are no active faults mapped at the site at depth. Using the USGS computer program (USGS, 2024) and the site coordinates of 33.759 degrees north latitude and 117.821 degrees west longitude, the controlling fault at the site is the Whittier Fault located 16.2 kilometers (10.1 miles) north of the site. The maximum Moment Magnitude for the Controlling Fault is 7.59 Mw. The other faults noted that can produce strong ground shaking at the site include the Newport-Inglewood (Offshore), San Joaquin Hills and Elsinore (Glen Ivy) Faults. Based on review of published maps, historic aerial photographs and topographic maps, the potential for primary ground rupture due to an earthquake is considered very low.

Seismicity: Properties in southern California are subject to seismic hazards of varying degrees depending upon the proximity, degree of activity, and capability of nearby faults. These hazards can be primary (i.e., directly related to the energy release of an earthquake, such as surface rupture and ground shaking) or secondary (i.e., related to the effect of earthquake energy on the physical world, which can cause phenomena such as liquefaction and ground lurching). The site is not located in a seismic hazard zone for liquefaction potential (CDMG, 1997), as shown in Figure 2. Liquefaction potential is discussed further in Section 2.5. Secondary seismic hazards, such as tsunami and seiche, need not be considered since the site is located over 5 miles from the ocean or any confined bodies of water and at elevations well above mean sea level.

As with the majority of sites in Southern California, the primary seismic hazard for this site is ground shaking due to a future earthquake on one of the major regional active faults, such as the San Joaquin Hills Blind Thrust, Newport-Inglewood, Whittier, or the Elsinore-Glen Ivy Faults. The site is designated as Class D for the seismicity analysis based on the Vs(30) shear wave velocity per ASCE 7-16 Table 20.3-1and collected field and laboratory test results from this site investigation. The seismic design parameters are presented in the Conclusions and Recommendations section of this report. Seismic design parameters were calculated based on a computer program by the Structural Engineers Association/Office of Statewide Health Planning and Development (2024). The results are tabulated in Section 3.5 and the data is included in Appendix D.

2.3 Groundwater

Groundwater was not encountered during our subsurface exploration to a maximum depth of 50.8 feet bgs. Additionally, Langan did not encounter groundwater in any of their borings to a maximum depth of 51.5 feet. Historic high groundwater is in excess of 40 feet deep below the site (CDMG, 1997). The present groundwater table is estimated to be greater than 100 feet deep based on data from a remediation well located 0.4 miles to the west of the site (Arcadis, 2015). A groundwater monitoring well is located 1.3 miles to the northwest at Portola Park with current groundwater depths approximately 160 feet bgs.

2.4 Soil Conditions and Classification

Based on the borings at the site, the existing soil moisture content varies from 1.7 to 16.8 percent and in-place dry density ranged from approximately 110.3 to 128.7 pcf. The near-surface soils (upper 5 feet) are damp to moist, and the native soils at depth are damp. The grain size testing indicates 6 to 63 percent fines content (passing No 200 sieve). Most of the soils are non-plastic however, some soils are clayey and had Liquid Limits of 27 to 33 percent and Plasticity Index of 13 to 17 percent. Maximum density tests were performed on two bulk samples collected from the upper 5 to 10 feet that consisted of sand with clay and gravel. The maximum dry density test results ranged from 126 to 134 pcf with optimum moisture content of 8.0 to 11.5 percent.

Based on the USCS classification, the existing fill and alluvium consists of crudely layered GP, SP, SC, ML, and CL soils. Zones with abundant gravel and cobbles were encountered between 5 to 20 feet. The soil sample descriptions, classification (USCS group symbol), in-situ soil dry density and moisture content are presented on the boring logs (Appendix B).

Direct shear tests were performed on two samples remolded to 90 percent (based on ASTM Test Method D1557) to evaluate the strength of reworked onsite soils, to assess the strength of the future fill material. The selected sample was a silty material sampled in the upper 5 feet. The test result indicated cohesion of 175 to 800 psf and a soil friction angle of 27 degrees.

Expansion index tests were performed on selected bulk samples to evaluate the expansion potential of onsite soils. Based on the laboratory test results, the expansion index (EI) varies from 21 to 31 which corresponds to "Low" expansion potential.

2.5 Liquefaction Potential

The subject site is not located within a zone of liquefaction potential as mapped by the State (Figure 2). Historic high groundwater is in excess of 40 feet below ground surface and the current groundwater table is in excess of 100 feet deep. Liquefaction potential at the subject site is considered low due to the significant depth to groundwater.

2.6 Settlement Potential

We anticipate the future compacted fill and underlying native alluvium will consist of dense, granular soils with low compressibility. Based on the foundation soils, future design grading, and the light structural loads, we anticipate the soils will have only minor settlement. The potential settlement due to seismic shaking should also be minor.

2.7 Existing Asphalt Pavement

The existing asphalt encountered during our subsurface exploration varied from 2 to 3.5 inches of asphalt concrete (AC) over 2 to 4 inches of aggregate base (AB). The prior R-value testing by Langan indicated the pavement subgrade soil consists of sandy clay with an R-vaule of 24.

2.8 Corrosivity Testing

Corrosion testing was performed by NMG and Langan on samples in the upper 5 feet. The corrosion evaluation included electrical resistivity, pH, soluble sulfate, and chloride. The specific soil analysis lab test results are presented in Appendix C and summarized below.

Soil Corrosion Test	***Test Results***
Minimum Resistivity (ohm-cm)	2,043 -2710
pH	7.5-8.3
Sulfate Content (ppm)	37 – 59
Chloride Content (ppm)	22 - 27

Electrical resistivities were in the moderately corrosive category with the in-situ moisture content. When saturated, the resistivities are in the moderately to severely corrosive categories for ferrous metals. The moisture content has a significant effect on the corrosivity of the site soils. Sulfate contents are negligible and indicate that onsite soils are not corrosive to concrete. The chloride contents are also negligible. Soil pH values indicate slight to medium alkalinity.

2.9 Earthwork Factors

The loss or gain of volume (shrinkage or bulking, respectively) of excavated natural materials and re-compaction as fill varies according to earth material type and location. This volume change is represented as a percentage shrinkage (volume loss) and as a percentage bulking (volume gain) after re-compaction of a unit volume of cut in this same material in its natural state. We anticipate the undocumented fill materials and near-surface alluvium will shrink on the order of 1 to 2 percent. Due to prior site use, subsidence at the site is anticipated to be negligible.

3.0 CONCLUSION AND PRELIMINARY RECOMMENDATIONS

3.1 General Conclusion

Based on review of the VTTM and Conceptual Site Plan, the proposed residential redevelopment at the site is considered geotechnically feasible. The primary geotechnical impacts are the recommended remedial grading and potential to encounter gravelly soils during deep utility excavations. The extent of the underlying gravels and cobbles in the alluvium appears to be variable based on the current data. This report provides the collected site-specific subsurface information and preliminary recommendations that can be used for planning and initial design at the site. Specific geotechnical recommendations for design, grading, and construction will be provided in future reports based on review of the actual project plans.

Our subsurface investigation confirmed that the site has up to 4 feet of undocumented fill consisting of clay, sandy clay, and clayey sand, over relatively dense alluvium consisting of gravel, and sand, with varying amounts of silt and clay. Groundwater is in excess of 50 feet below ground surface and is not anticipated to impact the subject development.

3.2 Site Preparation and Earthwork

General earthwork and grading specifications are provided below and in Appendix E. Grading will also have to satisfy the requirements of the City of Tustin. Prior to grading, deleterious material (highly organic topsoil, vegetation, trash, construction debris), if any, should be cleared from the site and disposed of offsite. The existing structures to be demolished and the buried utilities within the site should be removed and the areas properly backfilled. The demolition operation should minimize disturbing/loosening existing soils and should protect existing improvements to remain.

We recommend a minimum of 5-foot-deep remedial removals for the site to provide a new, uniform compacted fill blanket. The demolition operation and local variations in soil conditions may result in the need for deeper removals. Some of the existing utility lines may be locally deeper than the recommended remedial removals; therefore, special excavation for these lines may be necessary if encountered. Gravel and cobbles should be anticipated during remedial removals and deeper utility excavations.

The Portland cement concrete and asphaltic concrete from the demolition operation will need to be exported or crushed to be used onsite as crushed miscellaneous base or as fill. This will need to be evaluated with overall site earthwork.

Onsite materials that are relatively free of deleterious material should be suitable for use as compacted fill. Prior to placement of fill, the removal bottoms should be scarified a minimum of 6 inches, moisture-conditioned as needed, and compacted to minimum 90 percent relative compaction. The relative compaction should be based upon ASTM Test Method D1557-91.

The moisture content of the fill soil should be over optimum moisture content and consideration should be given to placing fill at higher moisture contents to facilitate the future presoaking process for slab-on-grade foundations. Fill material should be placed in loose lifts no greater than 8 inches

in thickness and compacted prior to placement of the next lift. Ground sloping steeper than 5:1 (horizontal to vertical) should be prepared by benching into firm competent material as fill is placed.

3.3 Settlement Potential

For preliminary foundation design purposes, we estimate total consolidation (static) settlement would not exceed 1 inch and differential settlement on the order of 0.5 inch over a span of 40 feet. Additional evaluation of the settlement should be performed once grading has been completed and structural loads become available.

3.4 Foundation and Slab Design Guidelines

Slab-on-grade foundations will be acceptable for the subject development. The design of shallow footings and slab-on-grade foundations will require collaboration between the geotechnical and structural engineers based on the anticipated structural loading conditions and considering the requirements of the 2022 CBC. For expansive soils, the CBC requires slab-on-grade foundations to be designed in accordance with the Post-Tension Institute (PTI) or Wire Reinforcement Institute (WRI) methodology.

3.5 Seismic Design Guidelines

The following table summarizes the seismic design criteria for the subject site. The seismic design parameters are developed in accordance with 2022 CBC and ASCE 7-16, including Supplement Nos. 1 through 3.

Selected Seismic Design Parameters from 2022 CBC/ASCE 7-16	***Seismic Design Values***	***Reference***
Latitude	33.759North	
Longitude	117.821West	
Controlling Seismic Source	Whittier	USGS, 2024
Distance to Controlling Seismic Source	10.1 mi (16.2 km)	USGS, 2024
Site Class per Table 20.3-1 of ASCE 7-16	D	SEA/OSHPD, 2024
Ss, Spectral Acceleration for Short Periods	1.31 g	SEA/OSHPD, 2024
$\mathbf{S_1}$, Spectral Accelerations for 1-Second Periods	0.71 g	SEA/OSHPD, 2024
$\mathbf{F_a}$, Site Coefficient, Table 11.4-1 of ASCE 7-16	1.0	SEA/OSHPD, 2024
$\mathbf{F_v}$, Site Coefficient, Table 11.4-2 of ASCE 7-16	1.83	
$\mathbf{S_{DS}}$, Design Spectral Response Acceleration at Short Periods from Equation 11.4-3 of ASCE 7-16	0.87 g	SEA/OSHPD, 2024
$\mathbf{S_{D1}}$, Design Spectral Response Acceleration at 1-Second Period from Equation 11.4-4 of ASCE 7-16	0.86 g*	
$\mathbf{T_S}$, S_{D1}/S_{DS}, Section 11.4.6 of ASCE 7-16	0.98 sec*	
$\mathbf{T_L}$, Long-Period Transition Period	8 sec	SEA/OSHPD, 2024
$\mathbf{PGA_M}$, Peak Ground Acceleration Corrected for Site Class Effects from Equation 11.8-1 of ASCE 7-16	0.58 g	SEA/OSHPD, 2024
Seismic Design Category, Section 11.6 of ASCE 7-16	D	

**These values have been increased by 50% as outlined in Supplement No. 3 of ASCE 7-16 Chapter 11.4.8.*

3.6 Pavement Design

We anticipate the future subgrade soils for pavements will have a minimum R-value of 20. Final structural pavement sections should be based on R-value testing after the completion of grading. The following preliminary pavement sections are for the assumed traffic indices (TIs). The final structural pavement design should be based on final TIs and the actual subgrade soil once the grading and utilities are completed.

Minimum Structural Pavement Section (Preliminary)			
Location	***TI***	***Composite Section***	***Full-Depth Section***
Parking areas	4.5	0.25' AC over 0.35' AB	0.50' AC
Drives	5.5	0.35' AC over 0.60' AB	0.55' AC
AC = Asphalt Concrete; AB = Aggregate Base			

Asphalt concrete should also be compacted to a minimum relative compaction of 95 percent. Please note that for two-stage paving operations, the initial based asphalt pavement layer should be a minimum of 0.25-foot AC and the final cap should be a minimum of 0.10 foot thick.

Prior to construction of pavement sections, the subgrade soils should be scarified to a minimum depth of 6 inches, moisture-conditioned as needed, and recompacted in place to a minimum of 90 percent relative compaction per ASTM D1557. The full-depth pavement area will require subgrade to have a minimum of 95 percent relative compaction. Subgrade for the proposed pavements should be uniform, firm, and unyielding.

AB materials can be crushed aggregate base or crushed miscellaneous base in accordance with the Greenbook (Section 200-2). The materials should be free of any deleterious materials. Aggregate base materials should be placed in 6- to 8-inch-thick loose lifts, moisture-conditioned as necessary, and compacted to a minimum of 95 percent relative compaction (per ASTM D1557).

3.7 Exterior Concrete and Concrete Pavers

The recommendations provided below should be used for design and construction measures of the concrete pavements/hardscape. These recommendations are considered minimum and may be superseded by more stringent requirements/standards of the City of Tustin, the Standard Specifications for Public Work Construction "Greenbook" or other designers. The public pavements and other exterior concrete improvements (within the street right-of-way) should be constructed in accordance with City of Tustin standards.

The subgrade for the concrete pavement areas should be competent material that has been compacted and moisture-conditioned in accordance with the remedial grading recommendations for the site. The subgrade shall be compacted to a minimum of 90 percent relative compaction (as determined based on ASTM Test Method 1557). For reducing the potential effects of expansive soils, we recommend presaturation of the subgrade prior to placement of the hardscape concrete. The recommended presaturation is 1.2 times optimum moisture to a depth of 12 inches.

The nominal thickness for the concrete hardscape should be 4 inches. Pavements anticipated to have periodic vehicular traffic should be provided with the appropriate aggregate base, reinforcement and restraints. Note that City standards may govern the required minimum thicknesses for the public concrete pavements/sidewalks and exterior concrete elements in the right-of-way. We recommend that longitudinal and transverse joint spacing for the concrete pavement be no more than 10 feet apart to control cracking. The depth of jointing must be at least ¼ of the slab thickness. Expansion joints need to be incorporated into the concrete pavements to allow for soil and thermal expansion (no more than 50 feet apart).

Specific recommendations will be required if concrete paver or decorative concrete pavements are planned for the vehicular/road or pedestrian areas.

3.8 Soil Corrosivity and Cement Type

The soil soluble sulfates exposures at the site as found to be "negligible". The subject site may be classified as "S0" per Table 19.3.2.1 of ACI-318-14. The chloride levels within the soils are classified as Class C1.

Concrete mix requirements for structural concrete should be based on the "S0" exposure class of Table 19.3.2.1 in ACI-318-14 that lists the appropriate type of cement, maximum water-cement ratio, and minimum concrete compressive strength.

Structural concrete elements in contact with soil include footings and building slabs-on-grade. Concrete improvements for streets, sidewalk and hardscape typically are not considered structural elements. The onsite soils are moderately to ferrous metals.

3.9 Pipelines, Trench Excavations, Temporary Shoring, and Backfill

Excavations should conform to the latest edition of OSHA requirements (shoring or layback of trench or excavation walls). The near-surface soils across most of the site are anticipated to be classified as Type B in compacted fill soils (upper 5 feet) and Type C in native alluvial soils (below a depth of 5 feet) for CalOSHA trenching and shoring excavation requirements. Excavations deeper than approximately 5 feet below existing ground surface will likely encounter gravelly soils.

Except for cobbles, the native soils should generally be suitable for use as trench backfill. Backfill materials should not have rocks greater that 12 inches in the maximum dimension and should be compacted to a minimum relative compaction of 90 percent (per ASTM D1557). We recommend that moisture content of native backfill to be over optimum moisture content. Select backfill may be used in lieu of native soils.

If a high-density, polyethylene (HDPE) pipe is proposed for the development, then excavation, installation, bedding, shading, and backfilling should be in strict accordance with the project and manufacturer's requirements. HDPE pipe has specific requirements for the width of the trench excavation.

3.10 Additional Geotechnical Review and Evaluation

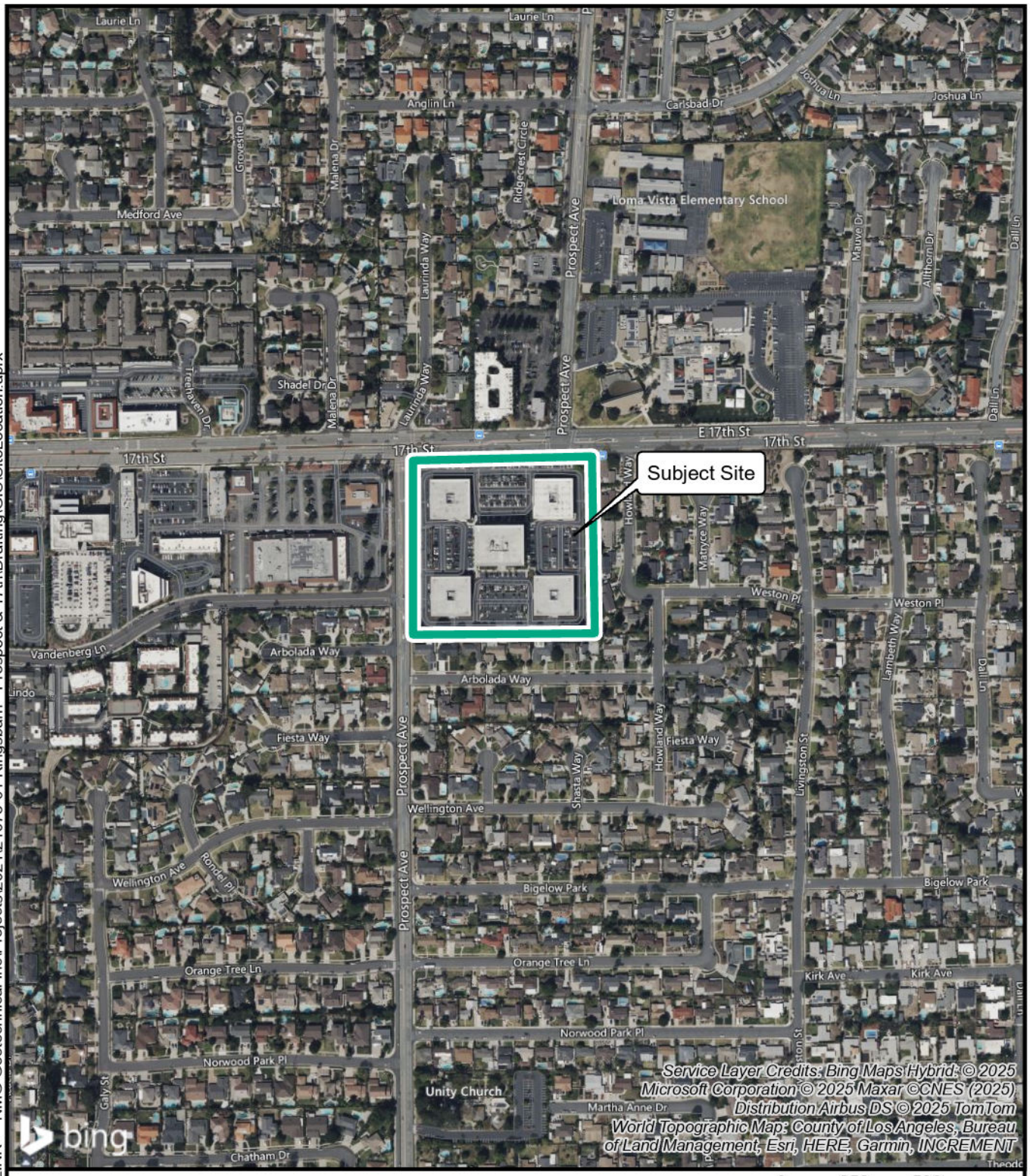
The future grading and improvement plan, and the building foundation plans should be reviewed and accepted by the geotechnical consultant prior to site grading and construction. Additional soil testing and analysis may be required for more detailed recommendations or may result in updated/revised recommendations.

4.0 LIMITATIONS

This report has been prepared for the exclusive use of our client, Kingsbarn Realty Capital, within the specific scope of services requested by them for the subject residential development in Tustin, California. This report or its contents should not be used or relied upon for other projects or purposes or by other parties without the written consent of NMG and the involvement of a geotechnical professional. The means and methods used by NMG for this study are based on local geotechnical standards of practice, care, and requirements of governing agencies. No warranty or guarantee, express or implied is given.

The findings, conclusions, and recommendations herein are professional opinions based on interpretations and inferences made from geologic and engineering data from specific locations and depths, observed or collected at a given time. By nature, geologic conditions can vary from point to point, can be very different in between points, and can also change over time. Our conclusions and recommendations are subject to verification and/or modification during excavation and construction when more subsurface conditions are exposed.

NMG's expertise and scope of services did not include assessment of potential subsurface environmental contaminants or environmental health hazards.



0 250 500 Feet

1 inch =500 feet

N

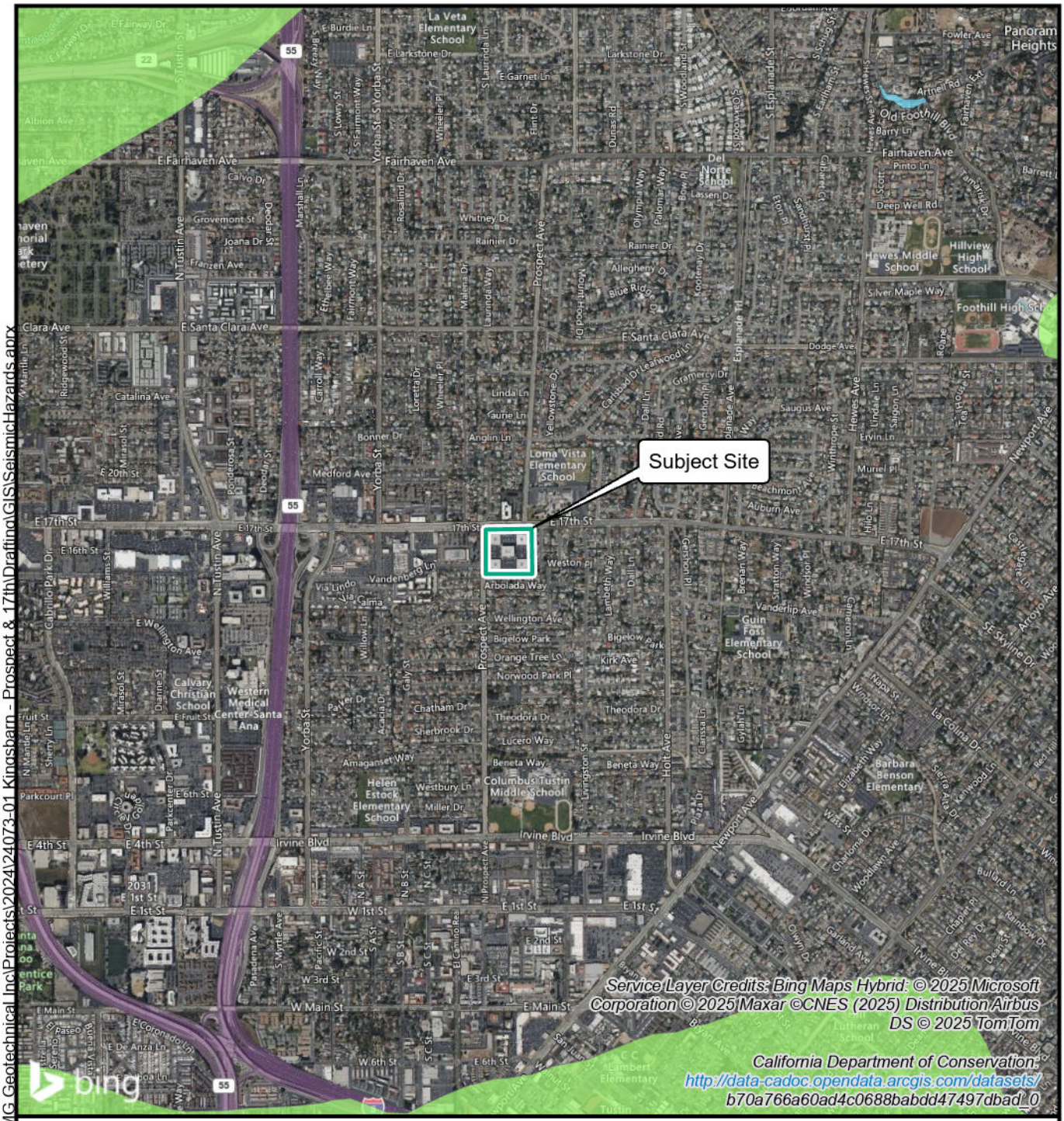
SITE LOCATION MAP

CYPRESS GROVE RESIDENTIAL DEVELOPMENT
VTTM 19390, PROSPECT AND 17TH STREET
CITY OF TUSTIN, CALIFORNIA

Project Number: 24073-01 By: WG/KGM
Project Name: Kingsbarn - Prospect & 17th
Date: 2/19/2025 Figure 1

NMG

<LINK>C:\Users\nmgguest\OneDrive</LINK> - NMG Geotechnical Inc\Projects\2024\24073-01 Kingsbarn - Prospect & 17th\Drafting\GIS\SiteLocation.aprx



Legend

- Liquefaction Zones
- Earthquake-Induced Landslide Zones

0 1,000 2,000 Feet

1 inch =2,000 feet

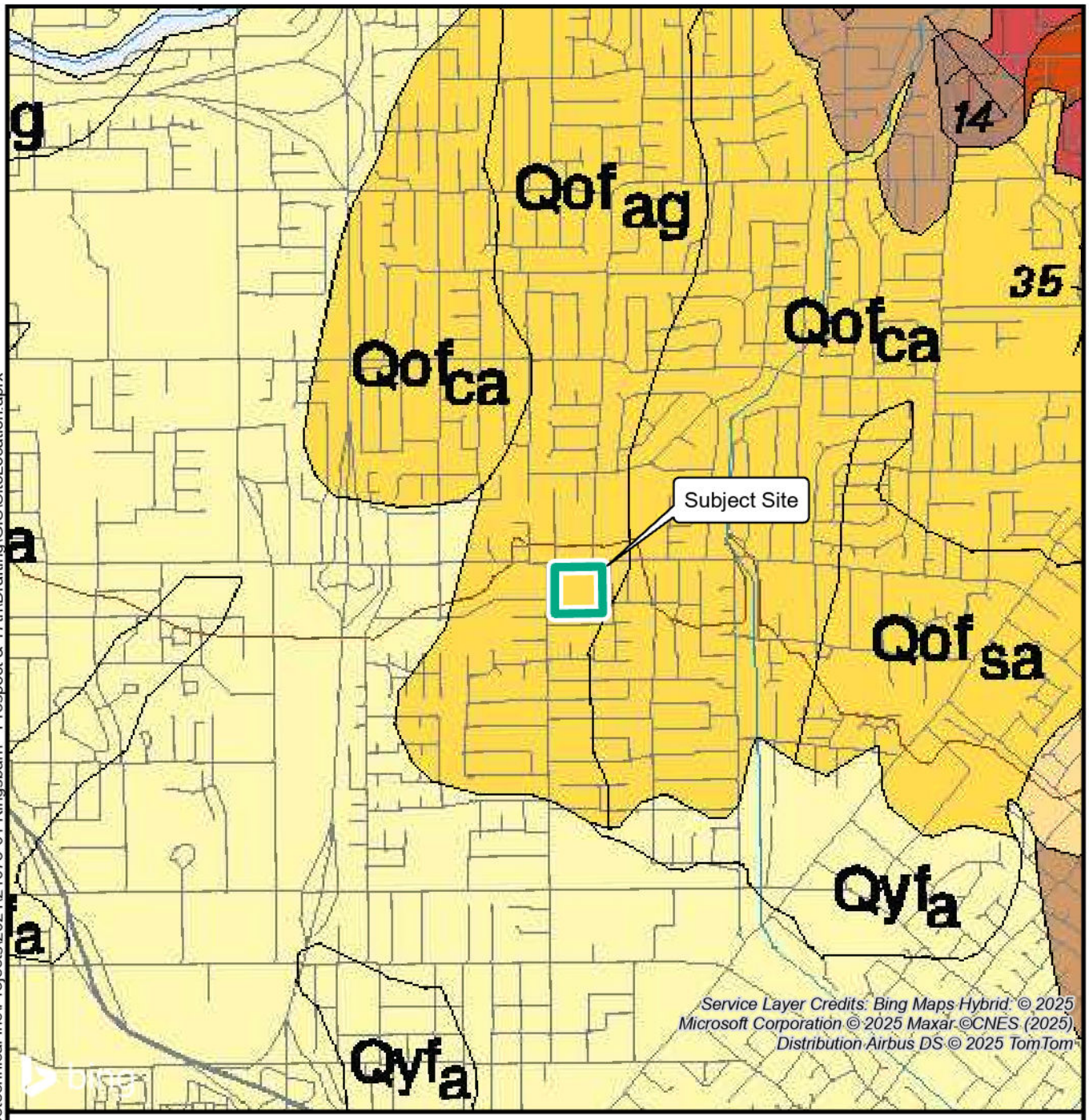
N

SEISMIC HAZARDS MAP

Base: California Geological Survey, Earthquake Zones of Required Investigation, Tustin Quadrangle
Dated: January 17, 2001

CYPRESS GROVE RESIDENTIAL DEVELOPMENT VTTM 19390, PROSPECT AND 17TH STREET CITY OF TUSTIN, CALIFORNIA	Project Number: 24073-01 By: WG/KGM Project Name: Kingsbarn - Prospect & 17th Date: 2/19/2025 Figure 2	NMG

<LINK>C:\Users\nmaguest\OneDrive</LINK> - NMG Geotechnical Inc\Projects\2024\24073-01 Kingsbarn - Prospect & 17th\Drafting\GIS\SeismicHazards.aprx



REGIONAL GEOLOGY MAP

California Department of Conservation, Division of Mines and Geology (CDMG), 2006, Geologic Map of San Bernadino and Santa Ana 30' x 60' Quadrangles, Open-File Report 2006-1217, Sheet 1, by Morton, P.K. and Miller, R.V.

CYPRESS GROVE RESIDENTIAL DEVELOPMENT
VTTM 19390, PROSPECT AND 17TH STREET
CITY OF TUSTIN, CALIFORNIA

Project Number: 24073-01 By: WG/KGM
Project Name: Kingsbarn - Prospect & 17th
Date: 2/19/2025 Figure 3

NMG

<LINK>C:\Users\nmgguest\OneDrive</LINK> - NMG Geotechnical Inc\Projects\2024\24073-01 Kingsbarn - Prospect & 17th\Drafting\GIS\SiteLocation.aprx

LEGEND

LOCATIONS ARE APPROXIMATE

● H-3 T.D.21.4' Qalo@3'	HOLLOW-STEM AUGER BORING BY NMG, THIS INVESTIGATION SHOWING TOTAL DEPTH AND DEPTH TO EARTH UNITS
▲ CPT-2A T.D.7.5'	CONE PENETROMETER TEST BY NMG, THIS INVESTIGATION SHOWING TOTAL DEPTH
◑ LB-3 T.D.51.5'	HOLLOW STEM AUGER BORING BY LANGAN (2024), SHOWING TOTAL DEPTH

GRAPHIC SCALE

40 0 20 40 80

(IN FEET)
1 inch = 40 ft.

BASEMAP: C&V CONSULTING

PLATE 1

BORING LOCATION MAP
CYPRESS GROVE, VTTM 19390
PROSPECT AND 17TH STREET
CITY OF TUSTIN, CALIFORNIA

Project No.: 24073-01 By: KGM/WG
Project Name: Kingsbarn/Prospect and 17th
Date: 2/19/2025 SCALE: 1" = 40'

NMG Geotechnical, Inc.

Drawing: C:\Users\vrodriguez\OneDrive - NMG Geotechnical Inc\Projects\2024\24073-01 Kingsbarn - Prospect & 17th\Drafting_WIP\24073-01 Boring location map.dwg Layout: Layout1 Last Saved: Mon Feb 17, 2025 - 4:15pm Last Plotted: Tue Feb 18, 2025 - 4:43pm By: vrodriguez

APPENDIX A

APPENDIX A

REFERENCES

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California Department of Conservation, Division of Mines and Geology (CDMG), 1980, Classification and Mapping of Quaternary Sedimentary Deposits for Purposes of Seismic Zonation, South Coastal Los Angeles Basin, Orange County, California, Open File Report 80-19 L.A.

California Department of Conservation, Division of Mines and Geology (CDMG), 1997, Seismic Hazard Zone Report 011 for the Orange 7.5-Minute Quadrangle.

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California Geological Survey (CGS), 2019, Earthquake Zones of Required Investigation, 7.5 Minute Tustin Quadrangle, found at https://gmw.conservation.ca.gov/SHP/EZRIM/Maps/ORANGE_EZRIM.pdf

Geotracker, 2023, State of California Water Resources Control Board Data Management System, website address: https://geotracker.waterboards.ca.gov/

Langan CA, Inc., 2024, Preliminary Geotechnical Report for Prospect Avenue & 17th Street, Tustin California, Project No. 700159001, dated September 6th, 2024.

Morton, P.K. and Miller, R.V, 2006, Geologic Map of San Bernadino and Santa Ana 30’ x 60’ Quadrangles, Open-File Report 2006-1217, Sheet 1.

Nationwide Environmental Title Research, LLC (NETR), 2024, Historic Aerials, https://www.historicaerials.com/ Date Accessed January 3, 2025

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APPENDIX A

REFERENCES (Cont'd)

U.S. Geological Survey, 2024, Unified Hazard Tool, NSHM 2014 Dynamic Deaggregation Program; web site address: https://earthquake.usgs.gov/hazards/interactive/; Date Accessed: January 31, 2025.

APPENDIX B

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	*GRAVEL AND GRAVELLY SOILS* MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	*CLEAN GRAVELS* (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	*CLEAN SANDS* (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND - SILT MIXTURES
			SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	*SILTS AND CLAYS*	LIQUID LIMIT LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Dual symbols are used to indicate gravels or sand with 5-12% fines and soils with fines classifying as CL-ML. Symbols separated by a slash indicate borderline soil classifications.

Sampler and Symbol Descriptions

- Modified California sample (D-#)
- Standard Penetration Test (S-#)
- Shelby tube sample (T-#)
- Large bulk sample (B-#)
- Small bulk sample (SB-#)
- Approximate depth of groundwater during drilling
- Approximate depth of static groundwater

Note: Number of blows required to advance driven sample 12 inches (or length noted).

Laboratory and Field Test Abbreviations

AL	Atterberg limits (plasticity)
CC	Chemical Testing incl. Soluble Sulfate
CN	Consolidation
DS	Direct Shear
EI	Expansion Index
GS	Grain Size Analysis (Sieve, Hydro. and/or -No. 200)
MD	Maximum Density and Optimum Moisture
RV	Resistance Value (R-Value)
SE	Sand Equivalent
UU	Unconsolidated Undrained Shear Strength

GENERAL NOTES

1. Soil classifications are based on the Unified Soil Classification System and include color, moisture, and relative density or consistency. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate. Bedrock descriptions are based on visual classification and include rock type, moisture, color, grain size, strength, and weathering.
2. Descriptions on these boring logs apply only at the specific boring locations and at the time the borings were drilled. They are not warranted to be representative of subsurface conditions at other locations or times.

KEY TO LOG OF BORING

Kingsbarn Prospect & 17th
Tustin, California
PROJECT NO. 24073-01

NMG Geotechnical, Inc.

Report: HOLLOW STEM; Project: 24073-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 2/13/25

Date(s) Drilled	**1/24/25**	Logged By	**SHC/DDK**
Drilling Company	**2R Drilling**	Drill Bit Size/Type	**8"**
Drill Rig Type	**CME 85**	Hammer Data	**140 lbs @ 30 inch drop**
Sampling Method(s)	**Modified California, Bulk**		
Approximate Groundwater Depth:	**No Groundwater Encountered**		
Comments			

H-1

Sheet 1 of 2

Total Depth Drilled (ft)	**26.3**
Approximate Ground Surface Elevation (ft)	**163.0 msl**

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0						Surface: Parking lot, 3.5" of Asphaltic concrete over 4" of aggregate base.			
			B-1			SC-CL	**Artificial Fill, Undocumented (Afu)** @ 1-2.5': Brown clayey medium SAND/sandy CLAY, moist, scattered gravel up to 1" in diameter.			B-1 @ 1-2.5', AL, CC, DS, GS, MD, EI
160							@ 2.5': No sample recovery.			
			D-1	13		GP	**Quaternary Old Alluvium (Qalo)**			
	5						@ 5': No sample recovery., large rock in tip.			B-2 @ 5-10', MD, EI
			D-2	14			@ 6': Drill rig chattering.			
			-1 & B-2							
			B-2							
			D-3	29			@ 7.5': No sample recovery, large rounded gravel up to 4" in diameter.	4.7		
	10						@ 10': No sample recovery, large rounded gravel up to 4" diameter in cuttings.			
			D-4	30			@ 12': Drill rig chattering.			
150										
	15						@ 15': Brown medium to coarse sandy GRAVEL, damp, very dense, large 4" diameter well rounded gravel in first two rings, no recovery in the tip, trace clay.	1.7	110.3	
			D-5	77						
	20						@ 20': Brown medium to coarse sandy GRAVEL, damp, very dense, rounded gravel up 2" in diameter.	2.4	120.4	
			D-6	81						
140										
	25									

LOG OF BORING

Kingsbarn Prospect & 17th
Tustin, California
PROJECT NO. 24073-01

NMG

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25		D-7	84/9"		GP	@ 25': Brown medium to coarse sandy GRAVEL, damp, very dense, rounded gravel up 2" in diameter.	3.7	128.7	
							Notes: Total Depth: 26.3 Feet. No Groundwater Encountered. Backfilled with Cuttings and Tamped. Patched with Quickset-Concrete and Black Dye.			
	30									
130										
	35									
	40									
120										
	45									
	50									
110										
	55									

LOG OF BORING

Kingsbarn Prospect & 17th
Tustin, California

PROJECT NO. 24073-01

NMG

Report: HOLLOW STEM; Project: 24073-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 2/13/25

Report: HOLLOW STEM; Project: 24073-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 2/13/25

Date(s) Drilled	1/24/25	Logged By	SHC/DDK
Drilling Company	2R Drilling	Drill Bit Size/Type	8"
Drill Rig Type	CME 85	Hammer Data	140 lbs @ 30 inch drop
Sampling Method(s)	Modified California, Bulk		
Approximate Groundwater Depth:	No Groundwater Encountered		
Comments			

H-2

Sheet 1 of 2

Total Depth Drilled (ft)	50.8
Approximate Ground Surface Elevation (ft)	162.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SC-CL	Surface: Parking lot, 2.5" of Asphaltic concrete over 3" of aggregate base.			
							Artificial Fill, Undocumented (Afu) @ 1': Large sandstone rock. @ 1-2.5': Brown sandy CLAY, damp, trace gravel.			B-1 @ 1-5', AL, CC, DS, EI, MD
160			B-1 D-1	19		GP	@ 2.5': Brown sandy CLAY/clayey SAND, damp, stiff, few scattered rounded gravel up to 1" in diameter, trace caliche, trace pinhole pores, trace organics.	7.3	116.3	
							Quaternary Old Alluvium (Qalo)			
	5		D-2	20			@ 5': No sample recovery, gravel.			B-2 @ 5-10'
							@ 6': Drill rig chattering.			
			B-2 D-3	53			@ 7.5': No sample recovery, well rounded gravel up to 2" in diameter, clayey sand. @ 8': Drill rig chattering.			
	10		D-4	81/10"			@ 10': No sample recovery, well rounded gravel up to 4" in diameter, scattered .5 to 1" gravel, grvel grading to finer grained from 10-15'. Drill rig chattering.			
150										
	15		D-5	57		CL	@ 15': Reddish brown medium sandy CLAY, hard, damp, trace mica, moderately plastic, scattered gravel.	8.7	120.6	
	20		D-6	58		ML	@ 20': Reddish brown fine sandy SILT, hard, dry, trace pinhole pores, trace pencil tip pores, trace coarse sand, trace organics.	7.8	120.8	
140										
	25									

LOG OF BORING

Kingsbarn Prospect & 17th
Tustin, California
PROJECT NO. 24073-01

NMG

Elevation (ft)	Depth (ft)	Sample Type	Sample Number	Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	25	D	7	50/6"		GP	@ 25': No sample recovery.			
	30	D	8	64/11"			@ 30': Brown clayey fine to medium sandy GRAVEL, damp, very dense. Drill rig chattering.	2.0		
130										
	35	D	9	66		CL	@ 35': Reddish brown fine sandy CLAY, dry, hard, scattered gravel, trace pinhole pores, trace lenses of coarse sand.	4.2	116.1	
	40	D	10	43		ML SM-GM	@ 40': Brown silty fine SAND/sandy GRAVEL, dry, dense, rounded gravel up to 1" in diameter. Drill rig chattering. Upper 4 rings: Reddish brown fine sandy SILT, dry, stiff, trace pinhole pores, micaceous, trace gravel.	2.8	111.1	
120										
	45	D	11	50/4"			@ 45': No sample recovery, bouncing on rock.			
	50	D	12	67/9"			@ 50': No sample recovery, bouncing on rock.			
110							Notes: Total Depth: 50.8 Feet. No Groundwater Encountered. Backfilled with Cuttings and Tamped. Patched with Quickset-Concrete and Black Dye.			
	55									

LOG OF BORING

Kingsbarn Prospect & 17th
Tustin, California

PROJECT NO. 24073-01

NMG

Report: HOLLOW STEM; Project: 24073-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 2/13/25

Date(s) Drilled	1/24/25	Logged By	SHC/DDK
Drilling Company	2R Drilling	Drill Bit Size/Type	8"
Drill Rig Type	CME 85	Hammer Data	140 lbs @ 30 inch drop
Sampling Method(s)	Modified California, Bulk		
Approximate Groundwater Depth:	No Groundwater Encountered		
Comments			

H-3

Sheet 1 of 1

Total Depth Drilled (ft)	21.4
Approximate Ground Surface Elevation (ft)	162.0 msl

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SC-CL	Surface: Parking lot, 2" of Asphaltic concrete over 2" of aggregate base.			
			B-1				**Artificial Fill, Undocumented (Afu)** @ 1-2.5': Dark brown fine sandy CLAY, moist, trace gravel.			B-1 @ 1-2.5'
160			D-1	16		GP	@ 2.5': Dark brown fine sandy CLAY/clayey SAND, medium dense/stiff, moist, scattered rouneded gravel up to 3", gravel in tip and first 2 rings.	11.8		
							Quaternary Old Alluvium (Qalo) @ 3-5': Gravel, rounded, 2-4" in diameter. Drill rig chattering.			
	5						@ 5': No sample recovery.			
							@ 6': Drill rig chattering.			
							@ 7.5': Gravel, rounded, up to 5" in diameter, minimal sand.			
	10		D-2	50/4"			@ 10': Brown fine to coarse sandy GRAVEL, damp to moist, very dense, rounded gravel up to 2" in diameter. Drill rig chattering.	3.1	127.8	
150										
	15		D-3	29		SC	@ 15': Reddish yellow clayey fine to coarse SAND, damp, medium dense, trace gravel up to 1" in diameter, trace pinhole pores.	5.9	117.4	
	20		D-4	93/11"		GP	@ 20': Reddish brown clayey fine to coarse sandy GRAVEL, moist, very dense, rounded gravel up to 2" in diameter.	6.1	124.5	
140							Notes: Total Depth: 21.4 Feet. No Groundwater Encountered. Backfilled with Cuttings and Tamped. Patched with Quickset-Concrete and Black Dye.			
	25									

LOG OF BORING

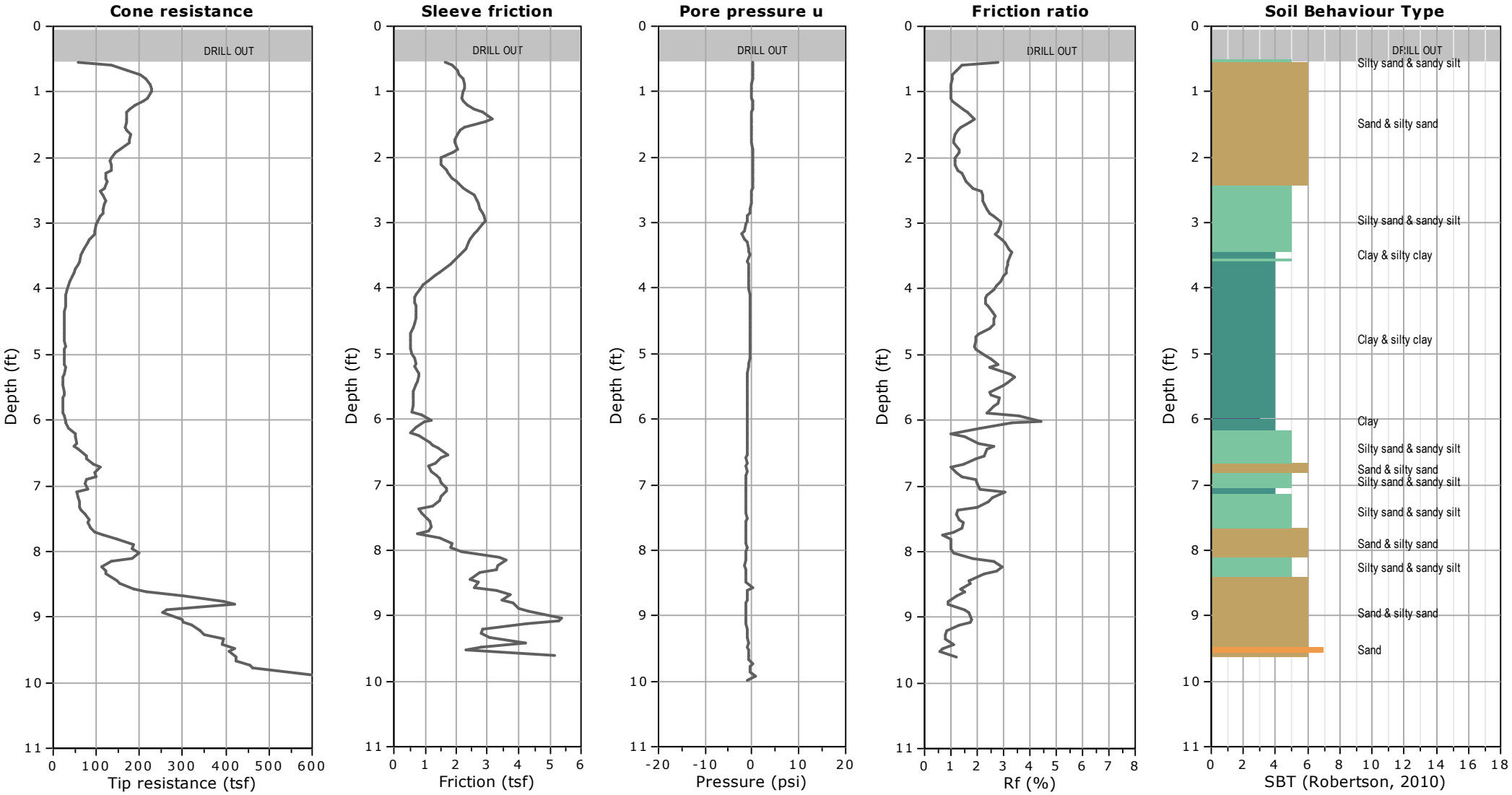
Kingsbarn Prospect & 17th
Tustin, California
PROJECT NO. 24073-01

NMG

Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: **NMG Geotechnical / Kingsbarn - Prospect and 17th St**
Location: **17822 17th St, Tustin, CA**

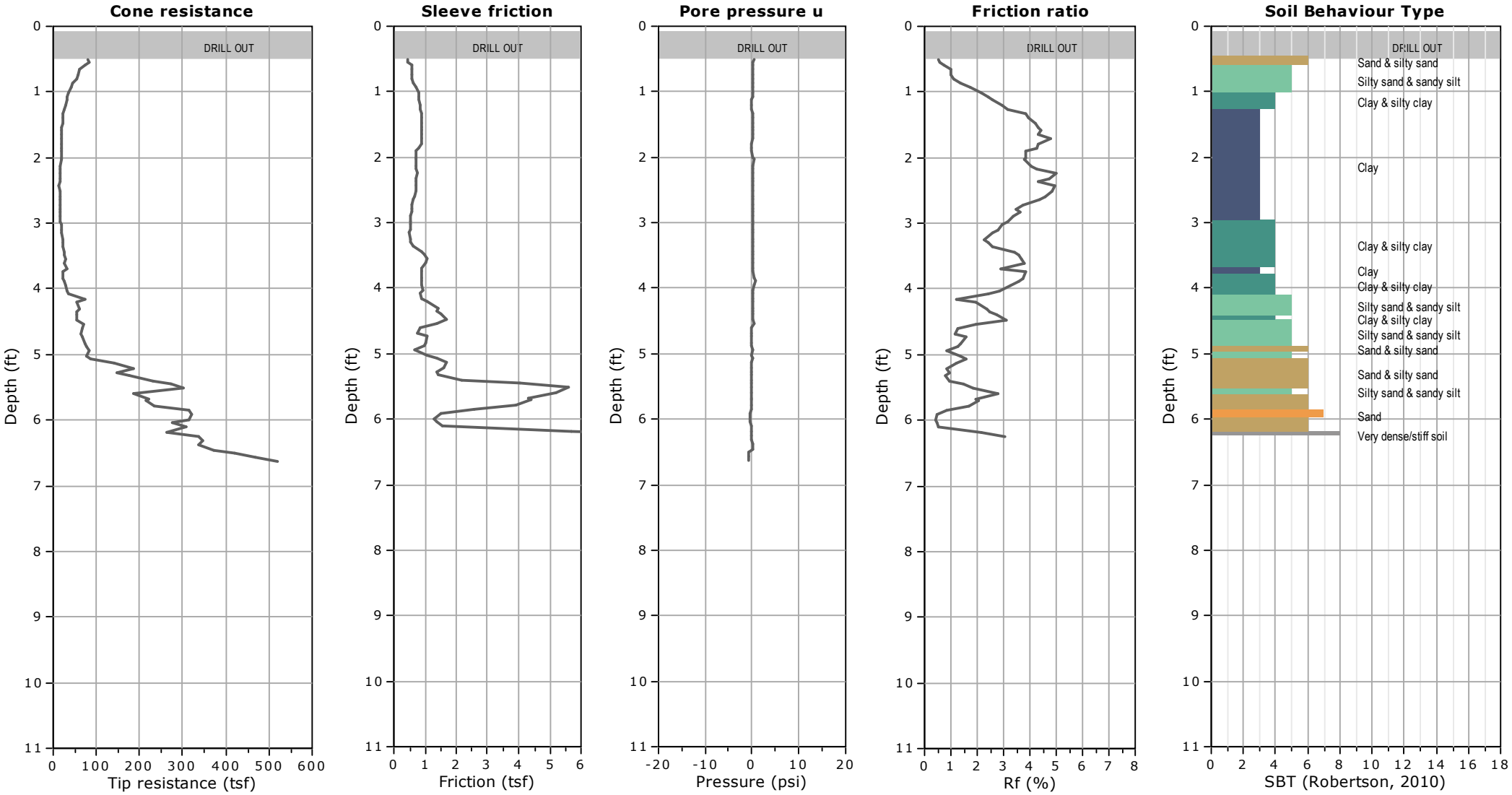
CPT-1
Total depth: 9.99 ft, Date: 1/24/2025



Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: **NMG Geotechnical / Kingsbarn - Prospect and 17th St**
Location: **17822 17th St, Tustin, CA**

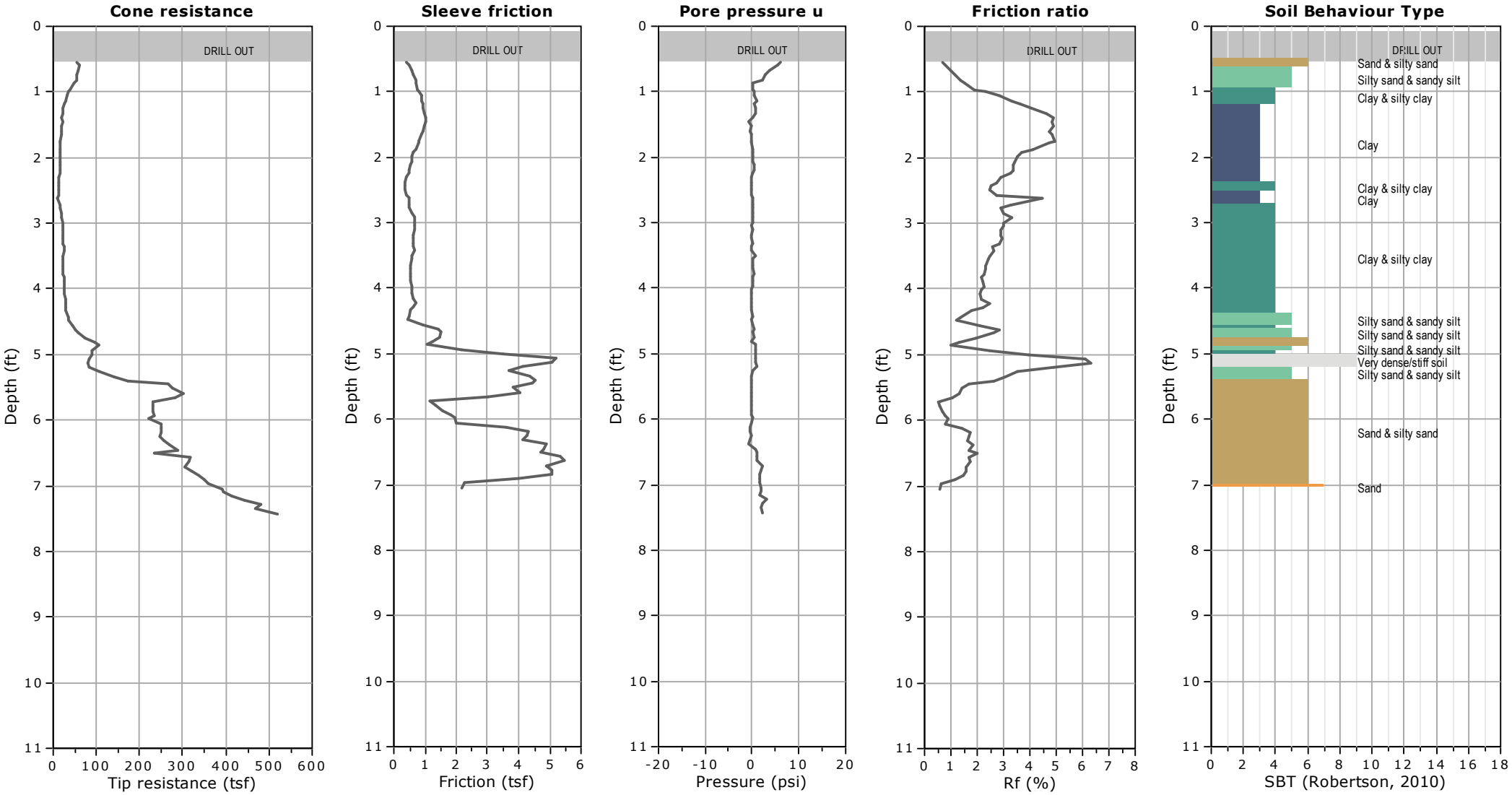
CPT-2
Total depth: 6.63 ft, Date: 1/24/2025



Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: **NMG Geotechnical / Kingsbarn - Prospect and 17th St**
Location: **17822 17th St, Tustin, CA**

CPT-2A
Total depth: 7.43 ft, Date: 1/24/2025



LANGAN

Log of Boring **LB-1** Sheet 1 of 3

Project: Prospect Avenue & 17th Street		Project No.: 700159001	
Location: Tustin, California		Elevation and Datum: 163.1 (NAVD88)	
Drilling Company: Martini Drilling Corporation		Date Started: 8/9/2024	Date Finished: 8/9/2024
Drilling Equipment: CME 75 Truck Mounted Drill Rig		Completion Depth: 51.5 ft	Rock Depth: Not Encountered
Size and Type of Bit: 8-inch O.D. Hollow Stem Auger		Number of Samples: Disturbed 11	Undisturbed 0 / Core 0
Casing Diameter (in): N/A	Casing Depth (ft): N/A	Water Level (ft.): First ▽ N/A	Completion ▼ N/A / 24 HR. ▼ N/A
Casing Hammer: N/A	Weight (lbs): N/A / Drop (in): N/A	Drilling Foreman: Jeff Fraizer	
Sampler: 2-inch O.D. Split Spoon & 3-inch O.D. California Modified		Field Engineer: Vanessa Ramirez	
Sampler Hammer: Automatic	Weight (lbs): 140 / Drop (in): 30		

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+163.1							10 20 30 40	
	+162.8		0						
	+162.4	4 inches of Asphalt Concrete							
		4 inches of Aggregate Base	1						
		Artificial Fill (af)	2						
		Brown to dark brown , CLAY, (CL), moist.	3						
	+159.1		4						
		Old Alluvial Fan Deposits (Qof)	5						EI = 21, See Appendix C
		Medium stiff, brown to dark brown, CLAY, some fine to coarse gravel, some fine to coarse sand, (CL), moist.	6	S-1	CR	18	4 9 8	• 17	
	+156.1		7						
		Dense, grayish, fine to coarse SAND with gravel, some cobbles, (SP), moist.	8	S-2	SS	12	10 28 26	• 54	
			9						
		Dense, grayish to brown, fine to coarse SAND with gravel, (SP), moist.	10						Rig chattering from 10 to 15 feet of drilling.
			11	S-3	SS	10	17 23 19	• 42	
	+150.1		12						
		Very stiff, brown, CLAY, some fine sand, (CL), moist.	13						
			14						
			15						
			16	S-4	SS	18	4 12 7	• 19	
	+145.1		17						
			18						
			19						
			20						

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Log of Boring **LB-1** Sheet 2 of 3

Project	Project No.
Prospect Avenue & 17th Street	700159001
Location	**Elevation and Datum**
Tustin, California	Approx. el. 163.1 (NAVD 88)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+143.1	Medium dense, grayish to brown, fine to coarse SAND with gravel, some silt, (SP), moist.	20	S-5	CR	18	13 18 20	38	
			21						
			22						
			23						
			24						
		Medium dense to dense, brown, fine to coarse SAND with gravel, some cobbles , (SP), moist.	25	S-6	CR	18	29 40 19	59	
			26						
			27						
			28						
			29						
		Very dense, grayish to brown, fine to coarse SAND with gravel, (SP), moist.	30	S-7	SS	12	7 10 50/4"	50/4"	
			31						
			32						
			33						
			34						
		Dense, light gray to brown, fine to coarse SAND with gravel, (SP), moist.	35	S-8	SS	18	15 23 19	42	
			36						
			37						
			38						
			39						
		Dense, grayish white to brown, fine to coarse SAND with gravel, (SP), moist.	40	S-9	SS	18	13 22 25	47	
			41						
			42						
			43						
			44						
			45						

N-Value scale: 10 20 30 40

Template: Log-BH; Strip: BH-GEO no line; Printed on 09/05/2024

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Log of Boring **LB-1** Sheet 3 of 3

Project	Project No.
Prospect Avenue & 17th Street	700159001
Location	**Elevation and Datum**
Tustin, California	Approx. el. 163.1 (NAVD 88)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+118.1	Very dense, grayish white to brown, fine to coarse SAND, trace fine gravel, (SP), moist.	45	S-10	SS	13	26 35	61	
			46						
			47						
			48						
			49						
		Very dense, grayish white to brown, fine to coarse SAND with gravel, (SP), moist.	50	S-11	SS	12	20 21 31	52	
	+111.6		51						
		End of Boring at 51.5ft.	52						End of boring. No groundwater encountered. Boring was backfilled with cement grout using the tremie method. Surface was patched with quickset concrete.
		DD = Dry Density pcf = pounds per cubic foot MC = Moisture Content EI = Expansion Index LL = Liquid Limit PI = Plasticity Index	53						
			54						
			55						
			56						
			57						
			58						
			59						
			60						
			61						
			62						
			63						
			64						
			65						
			66						
			67						
			68						
			69						
			70						

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Log of Boring **LB-2** Sheet 1 of 2

Project: Prospect Avenue & 17th Street		Project No.: 700159001	
Location: Tustin, California		Elevation and Datum: 162.1 (NAVD88)	
Drilling Company: Martini Drilling Corporation		Date Started: 8/9/2024	Date Finished: 8/9/2024
Drilling Equipment: CME 75 Truck Mounted Drill Rig		Completion Depth: 26.5 ft	Rock Depth: Not Encountered
Size and Type of Bit: 8-inch O.D. Hollow Stem Auger		Number of Samples: Disturbed 6	Undisturbed 0 / Core 0
Casing Diameter (in): N/A	Casing Depth (ft): N/A	Water Level (ft.): First ▽ N/A	Completion ▼ N/A / 24 HR. ▼ N/A
Casing Hammer: N/A	Weight (lbs): N/A / Drop (in): N/A	Drilling Foreman: Jeff Fraizer	
Sampler: 2-inch O.D. Split Spoon & 3-inch O.D. California Modified		Field Engineer: Vanessa Ramirez	
Sampler Hammer: Automatic	Weight (lbs): 140 / Drop (in): 30		

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+162.1		0						
	+161.8								
	+161.5	3 inches of Asphalt Concrete							Collected bag sample from 0.5 to 5 feet. At 0.5 to 5 feet: Sieve analysis, % Passing #200 = 45, see Appendix C
		4 inches of Aggregate Base	1						
		Artificial Fill (af)							
		Light brown to brown, clayey fine to coarse SAND, trace cobbles, (SC), moist.	2						
	+158.6		3						
		Old Alluvial Fan Deposits (Qof)	4						
		Dark brown, silty CLAY, (CL), moist.							
		soft to medium stiff, brown to dark brown, CLAY, some fine to coarse gravel, some fine to coarse sand, (CL), moist.	5	S-1	CR	18	2 3 7	• 10	DD = 114 pcf, MC = 13%, LL = 27, & PI = 13, see Appendix C
	+155.1		6						
		Medium dense, grayish to brown, fine to coarse SAND with silt and gravel, trace cobbles, (SW-SM), moist.	7	S-2	SS	10	7 12 8	• 20	Rig chattering from 7.5 to 10 feet of drilling. Sieve analysis, % Passing #200 = 6, see Appendix C
			8						
			9						
		Dense, light brown to brown, fine to coarse SAND with silt and gravel, (SW-SM), moist.	10	S-3	SS	10	10 15 23	38 •	
			11						
			12						
			13						
			14						
		Medium dense, brown to dark brown, fine to coarse SAND with silt and gravel, some cobbles, trace clay, (SW-SM), moist.	15	S-4A	CR	18	15 14 22	36 •	
	+146.3		16	S-4B					
		Very stiff , brown, CLAY, trace fine to coarse sand, trace cobbles, (CL), moist.	17						
			18						
			19						
			20						

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Log of Boring **LB-2** Sheet 2 of 2

Project	Project No.
Prospect Avenue & 17th Street	700159001
Location	**Elevation and Datum**
Tustin, California	Approx. el. 162.1 (NAVD 88)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+142.1	Stiff to very stiff, brown, CLAY, trace silt, (CL), moist.	20	S-5	SS	18	4 7 9	• 16	MC = 16.8%, LL = 33, PI = 17, see Appendix C
	+139.1	Dense, grayish to light brown, fine to coarse SAND, some fine to coarse gravel, trace silt, (SP), moist.	25	S-6	SS	12	12 19 12	31 •	
	+135.6	End of Boring at 26.5ft.	27						End of boring. No groundwater encountered. Boring was backfilled with cement grout using the tremie method. Surface was patched with quickset concrete.

DD = Dry Density
pcf = pounds per cubic foot
MC = Moisture Content
EI = Expansion Index
LL = Liquid Limit
PI = Plasticity Index

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Log of Boring **LB-3** Sheet 1 of 2

Project: Prospect Avenue & 17th Street	Project No.: 700159001
Location: Tustin, California	Elevation and Datum: 161.3 (NAVD88)
Drilling Company: Martini Drilling Corporation	Date Started: 8/9/2024 / Date Finished: 8/9/2024
Drilling Equipment: CME 75 Truck Mounted Drill Rig	Completion Depth: 26.4 ft / Rock Depth: Not Encountered
Size and Type of Bit: 8-inch O.D. Hollow Stem Auger	Number of Samples: Disturbed 6 / Undisturbed 0 / Core 0
Casing Diameter (in): N/A / Casing Depth (ft): N/A	Water Level (ft.): First ▽ N/A / Completion ▼ N/A / 24 HR. ▼ N/A
Casing Hammer: N/A / Weight (lbs): N/A / Drop (in): N/A	Drilling Foreman: Jeff Fraizer
Sampler: 2-inch O.D. Split Spoon & 3-inch O.D. California Modified	Field Engineer: Vanessa Ramirez
Sampler Hammer: Automatic / Weight (lbs): 140 / Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks
	+161.3							10 20 30 40	(Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+161.0		0						
	+160.7	3 inches of Asphalt Concrete	1						Collected bag sample from 0.5 to 5 feet. At 0.5 to 5 feet: Sieve analysis, % Passing #200 = 42, see Appendix C
		4 inches of Aggregate Base							
		Artificial Fill (af)	2						
		Tannish-brown, fine to coarse SAND, some cobbles, some silt, (SP), moist.	3						
	+158.3								
		Old Alluvial Fan Deposits (Qof)	4						
		Brown, CLAY, some cobbles, some fine to coarse gravel, trace fine to coarse sand, (CL), moist.							
		Soft to medium stiff, brown, CLAY, some cobbles, some fine to coarse gravel, trace fine sand to medium sand, (CL), moist.	5	S-1	CR	18	3 4 6	10	
	+154.3		6						
		Medium dense, brown, fine to coarse SAND with gravel, some cobbles, (SP), moist.	7						
			8	S-2	SS	4	11 16 19	35	
		Dense, no recovery.	9						
			10	S-3	SS	0	11 22 28	50	Rig chattering from 10 to 15 feet of drilling.
			11						
			12						
			13						
			14						
		Medium dense, light brown, fine to coarse SAND with gravel, some clay, some cobbles, (SP), dry.	15	S-4	CR	6	50	50	
	+143.8		16						
			17						
			18						
			19						
			20						

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Log of Boring **LB-3** Sheet 2 of 2

Project	Project No.
Prospect Avenue & 17th Street	700159001
Location	**Elevation and Datum**
Tustin, California	Approx. el. 161.3 (NAVD 88)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+141.3	Hard, brown, CLAY with fine to coarse gravel, some fine to coarse sand, some cobbles, (CL), dry.	20						
			21	S-5	CR	12	22 35 32	67	
			22						
	+138.3		23						
			24						
		Very dense, light gray to brown, fine to coarse SAND, some fine to coarse gravel, trace clay, (SP), dry.	25						
			26	S-6	SS	18	11 30 50/5"	50/5"	
	+134.9	End of Boring at 26.4ft.	27						End of boring. No groundwater encountered. Boring was backfilled with cement grout using the tremie method. Surface was patched with quickset concrete.
		DD = Dry Density pcf = pounds per cubic foot MC = Moisture Content EI = Expansion Index LL = Liquid Limit PI = Plasticity Index	28						
			29						
			30						
			31						
			32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						

APPENDIX C

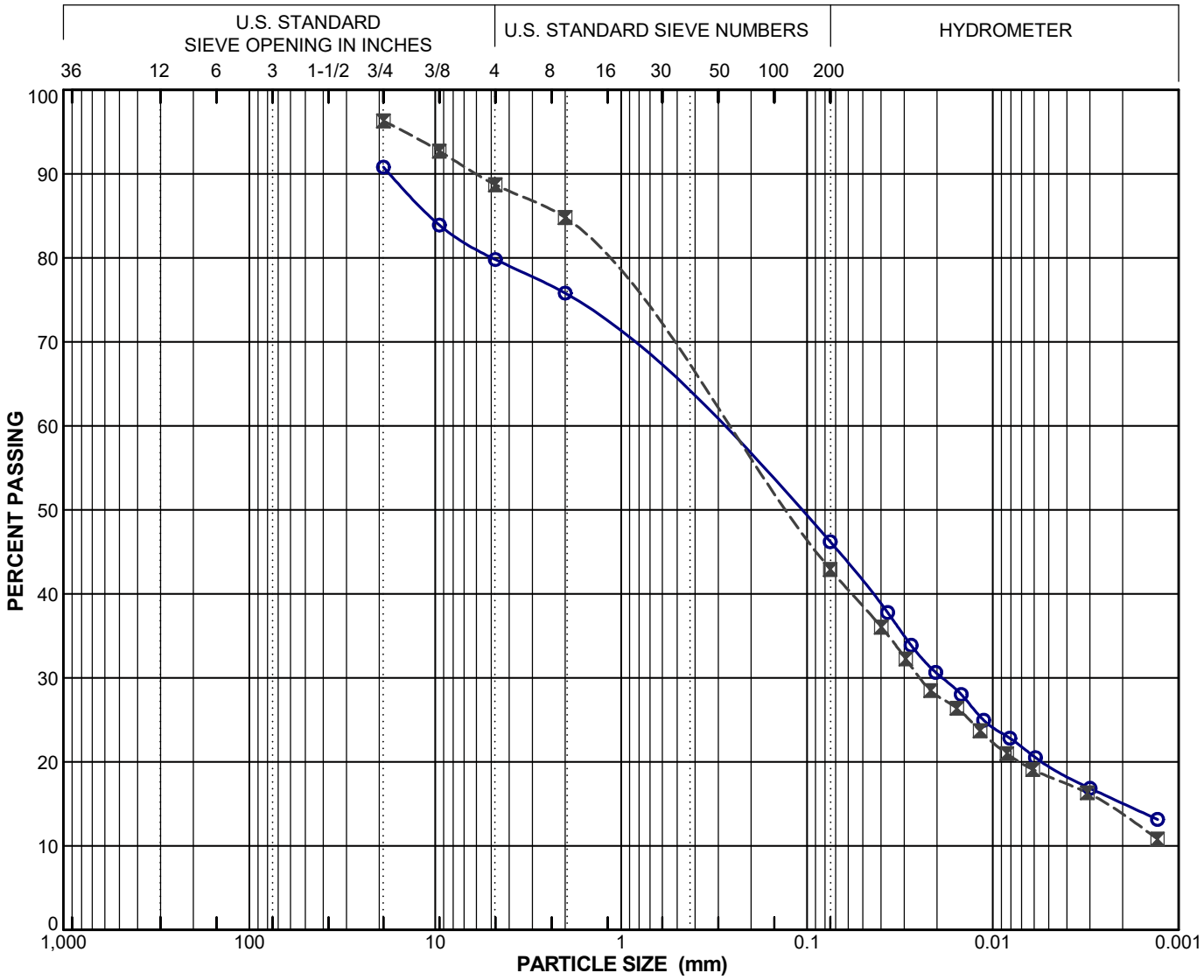
Kingsbarn Prospect & 17th
Project Number: 24073-01

APPENDIX C
SUMMARY OF SOIL LABORATORY DATA

Tustin, California

Boring/Sample Information						Field Wet Density (pcf)	Field Dry Density (pcf)	Field Moisture Content (%)	Degree of Sat. (%)	Sieve/ Hydrometer		Atterberg Limits		USCS Group Symbol	Direct Shear				Compaction		Expansion Index	R-Value	Soluble Sulfate Content (% by wt)	Remarks
															Ultimate		Peak							
Boring No.	Sample No.	Depth (feet)	End Depth (feet)	Elevation (feet)	Blow Count (N)					Fines Content (% pass. #200)	Clay Content (% pass. 2μ)	LL (%)	PI (%)		Cohesion (psf)	Friction Angle (°)	Cohesion (psf)	Friction Angle (°)	Maximum Dry Density (pcf)	Optimum Moisture Content (%)				
H-1	B-1	1.0	2.5	162.0						46	15	27	10	SC	175	27	800	27.0						CC
H-1	B-1 & B-2	1.0	10.0	162.0										SC					134.0	8.0	32			
H-2	B-1	1.0	5.0	161.0						43	14	26	8	SC	175	27	475	27.0	126.0	11.0	21			CC
H-3	B-1	1.0	2.5	161.0																				

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	



Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2μ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2μ (%)	USCS
O	H-1	B-1	1.0 - 2.5	17	27	10	0.67			46	15	SC
⊠	H-2	B-1	1.0 - 5.0	18	26	8	0.57			43	14	SC

PARTICLE SIZE DISTRIBUTION

Kingsbarn Prospect & 17th
Tustin, California
PROJECT NO. 24073-01

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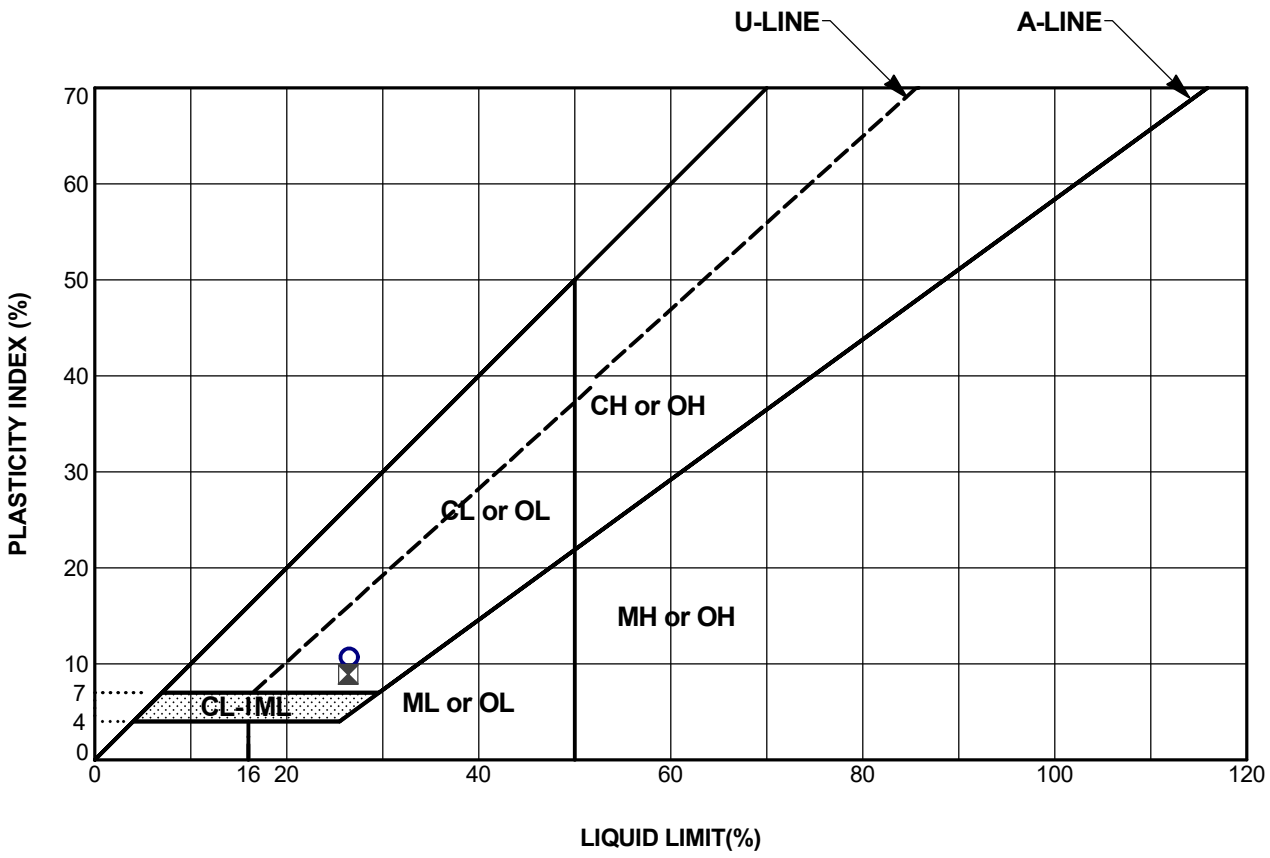

Symbol	Boring Number	Sample Number	Depth (feet)	Passing No. 200 Sieve (%)	LL	PI	USCS	Description
○	H-1	B-1	1.0 - 2.5	46	27	10	SC	(Afu) Dark yellowish brown clayey SAND
⊠	H-2	B-1	1.0 - 5.0	43	26	8	SC	(Afu) Light brown clayey SAND

PLASTICITY CHART

Kingsbarn Prospect & 17th
Tustin, California
PROJECT NO. 24073-01

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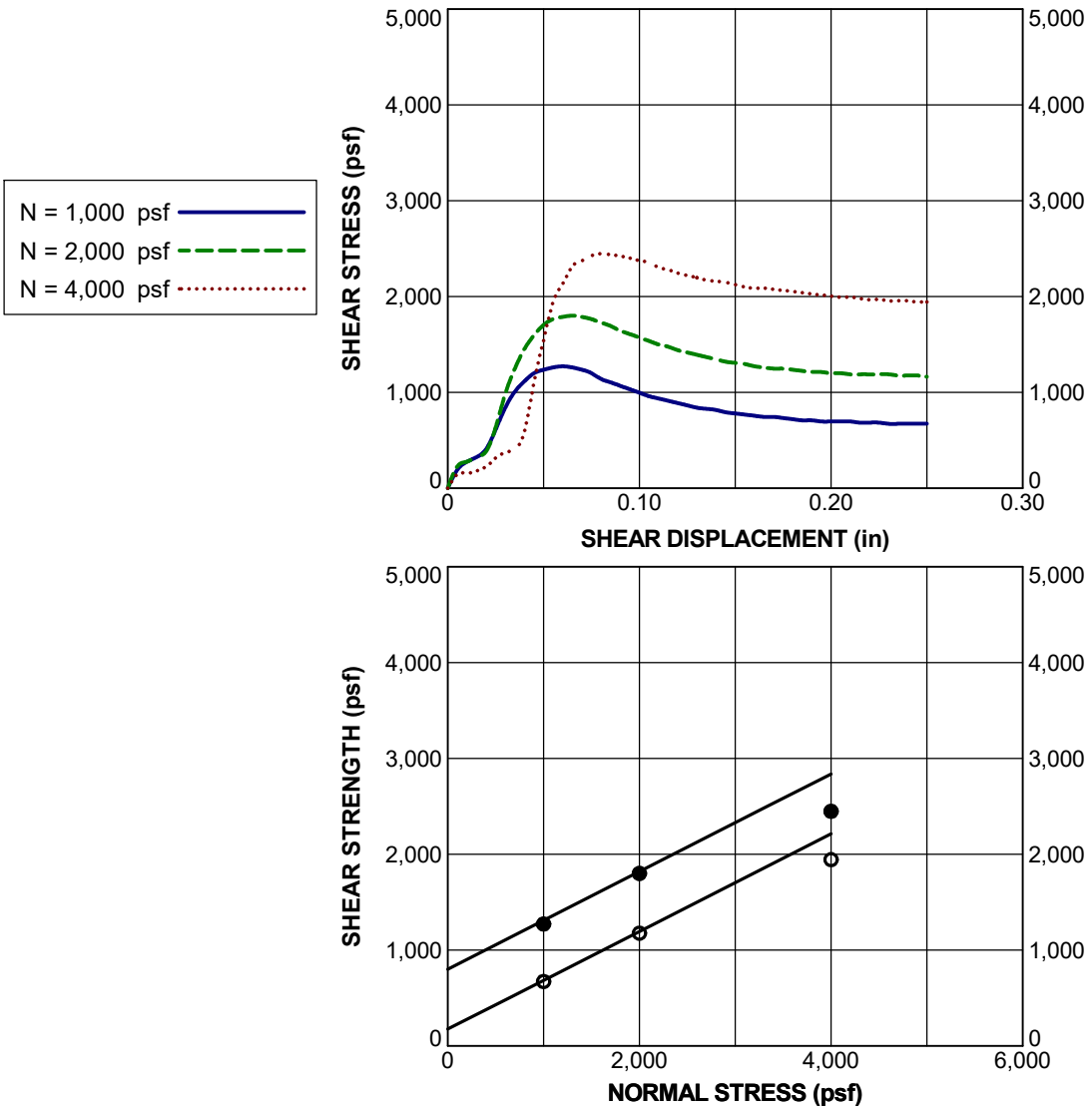


Boring No. H-1		**Sample No. B-1**		**Depth: 1.0 - 2.5 ft**	
Sample Description: (Afu) Dark yellowish brown clayey SAND				**USCS:** SC	
Liquid Limit:	27	**Plasticity Index:**	10	**Percent Passing No. 200 Sieve:**	46
Final Moisture Content (%):	17.2	**Final Dry Density (pcf):**	120.5	**Degree of Saturation (%):**	99
Sample Type:	Remolded to 90% RC	**Rate of Shear (in./min.):**	0.005		

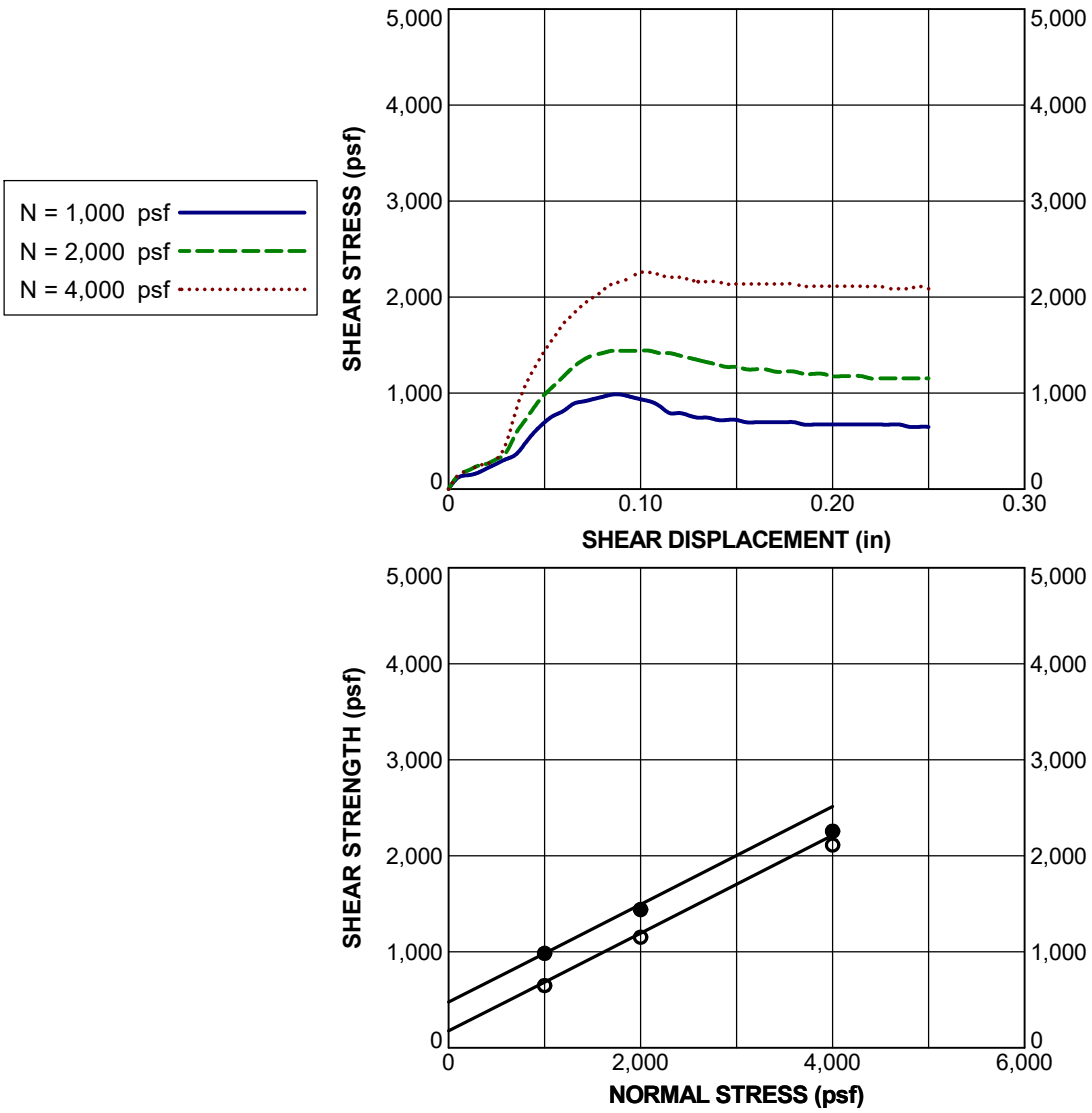
SHEAR STRENGTH PARAMETERS

Parameter	Peak ●	Ultimate ○
Cohesion (psf)	800	175
Friction Angle (degrees)	27.0	27.0

DIRECT SHEAR TEST RESULTS

Kingsbarn Prospect & 17th
Tustin, California
PROJECT NO. 24073-01

NMG Geotechnical, Inc.



Boring No. H-2	Sample No. B-1	Depth: 1.0 - 5.0 ft
Sample Description: (Afu) Light brown clayey SAND		**USCS:** SC
Liquid Limit: 26	**Plasticity Index:** 8	**Percent Passing No. 200 Sieve:** 43
Final Moisture Content (%): 17.6	**Final Dry Density (pcf):** 113.4	**Degree of Saturation (%):** 98
Sample Type: Remolded to 90% RC	**Rate of Shear (in./min.):** 0.005	

SHEAR STRENGTH PARAMETERS

Parameter	Peak ●	Ultimate ○
Cohesion (psf)	475	175
Friction Angle (degrees)	27.0	27.0

DIRECT SHEAR TEST RESULTS

Kingsbarn Prospect & 17th
Tustin, California
PROJECT NO. 24073-01

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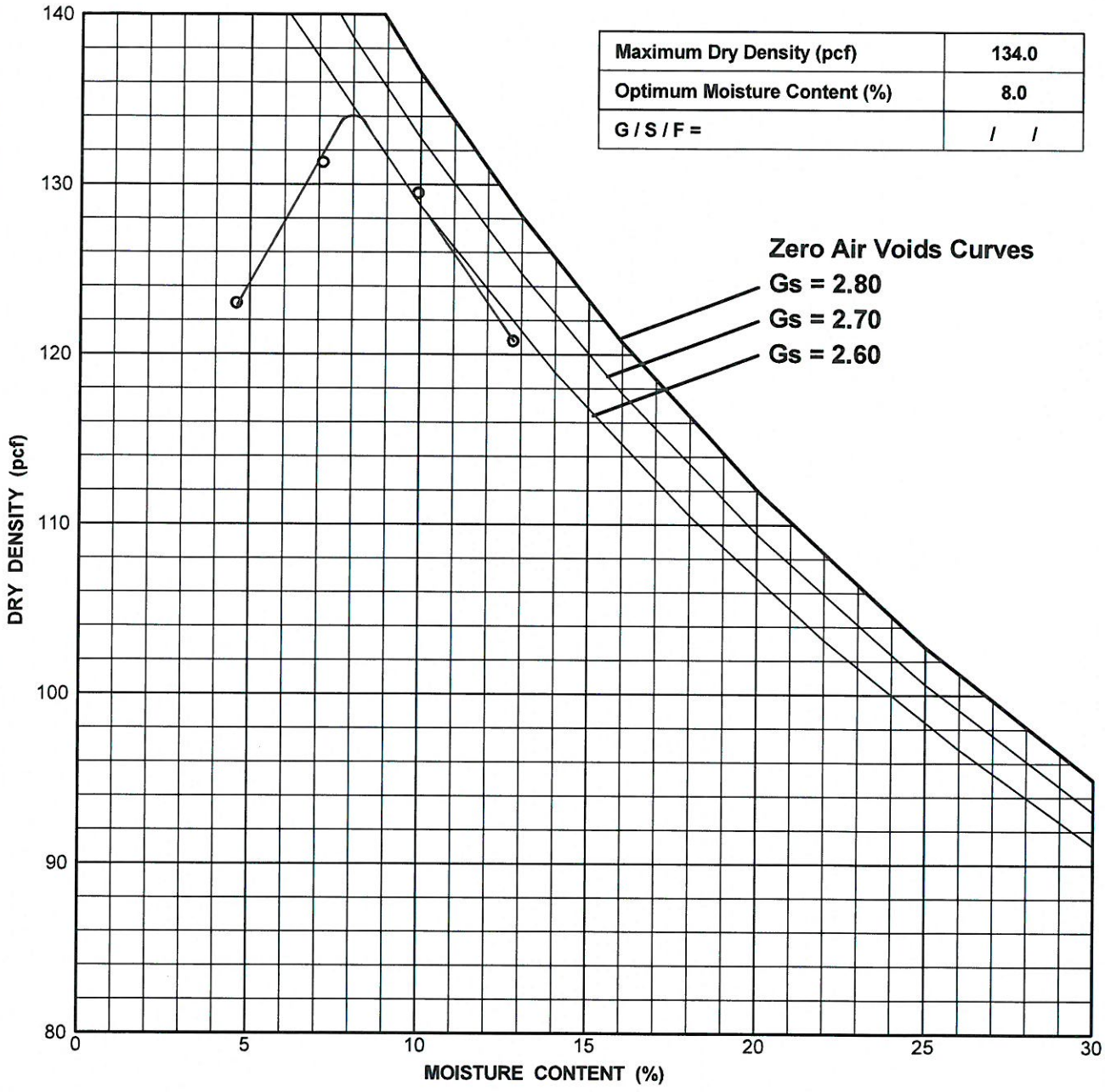


Maximum Dry Density (pcf)	134.0
Optimum Moisture Content (%)	8.0
G / S / F =	/ /

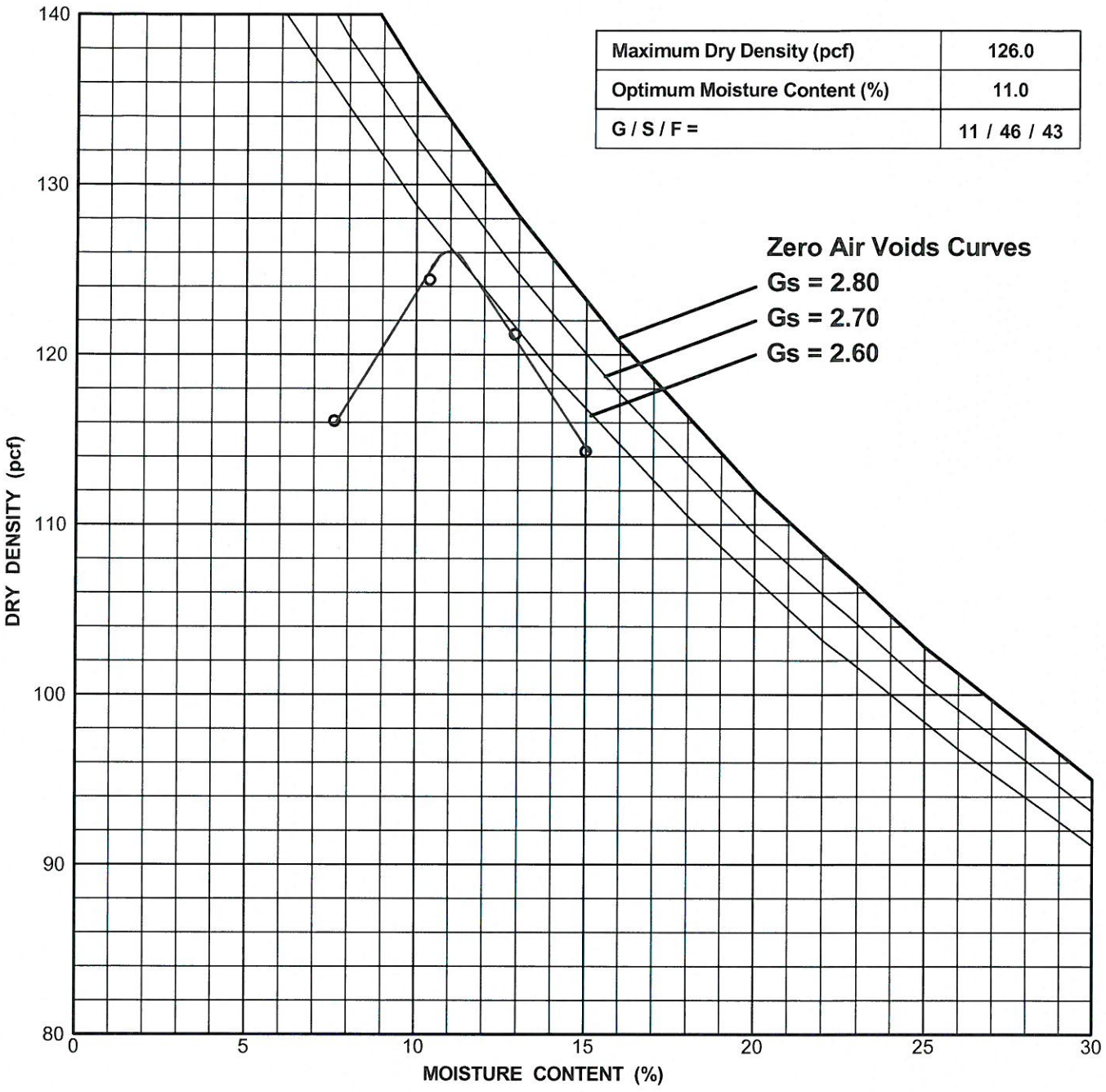
Boring No. H-1	**Sample No. B-1 & B-2**	**Depth: 1.0 - 10.0 ft**
Sample Description: (Afu, Qalo) Dark yellowish brown clayey SAND		**USCS:** SC
Liquid Limit:	**Plasticity Index:**	**Percent Passing No. 200 Sieve:**
Comments: 1557C		

COMPACTION TEST RESULTS

Kingsbarn Prospect & 17th
Tustin, California
PROJECT NO. 24073-01

NMG Geotechnical, Inc.

Maximum Dry Density (pcf)	126.0
Optimum Moisture Content (%)	11.0
G / S / F =	11 / 46 / 43



Boring No. H-2	**Sample No. B-1**	**Depth: 1.0 - 5.0 ft**
Sample Description: (Afu) Light brown clayey SAND		**USCS:** SC
Liquid Limit: 26	**Plasticity Index:** 8	**Percent Passing No. 200 Sieve:** 43
Comments: 1557C		

COMPACTION TEST RESULTS

Kingsbarn Prospect & 17th
Tustin, California
PROJECT NO. 24073-01

NMG Geotechnical, Inc.

Sample	Compacted Moisture (%)	Compacted Dry Density (pcf)	Final Moisture (%)	Volumetric Swell (%)	Expansion Index[1] Value/Method		Expansive Classification[2]	Soluble Sulfate (%)	Sulfate Exposure[3]
H-1 B-1 1-2.5'	8.0	116.3	15.9	31.9	32	A	Low	--	--
H-2 B-1 1-5'	10.0	108.0	20.0	2.09	21	A	Low	--	--

Test Method:
ASTM D4829

HACH SF-1 (Turbidimetric)

Notes:
1. Expansion Index (EI) method of determination*:*
   [A] E.I. determined by adjusting water content to achieve a 50 ±2% degree of saturation
   [B] E.I. calculated based on measured saturation within the range of 40% and 60%
2. ASTM D4829 *(Classification of Expansive Soil)*
3. ACI-318-14 Table 19.3.1.1 *(Requirement for Concrete Exposed to Sulfate-Containing Solutions)*

Expansion Index and Soluble Sulfate Test Results

(FRM001 Rev.5)

Project No. 24073-01

Project Name: Kingsbarn/ 17th

NMG

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MOISTURE AND DENSITY TEST RESULTS

ASTM D2216 and ASTM D7263 (Method B)

Client: Langan Engineering
Project Name: Prospect Ave & 17th Street
Project No.: 700159001

AP Lab No.: 24-0847
Test Date: 08/20/24

Boring No.	Sample No.	Sample Depth (ft.)	Moisture Content (%)	Dry Density (pcf)
LB-2	S-1	5	13.0	113.7
LB-2	S-5	20	16.8	NA

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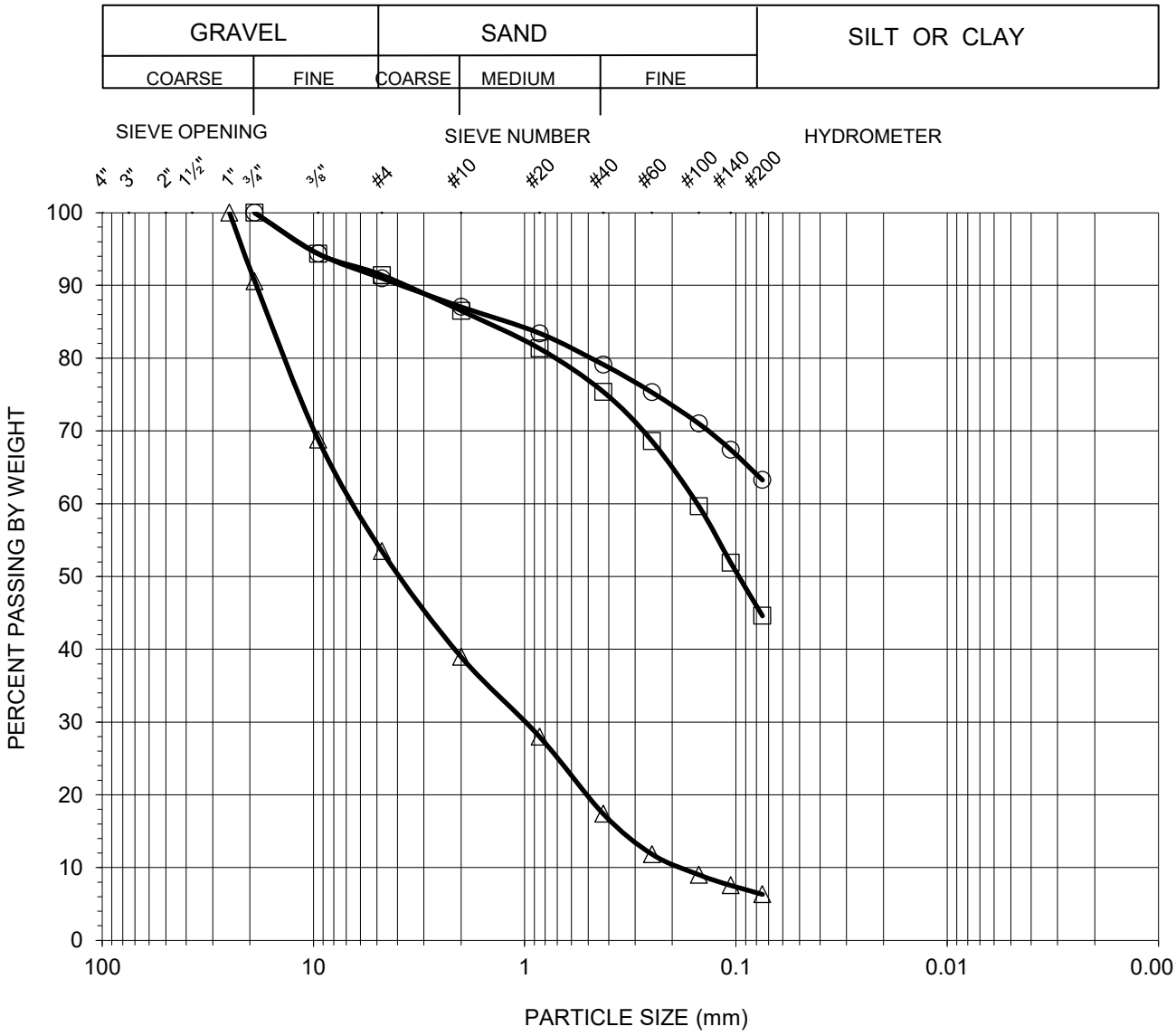
GRAIN SIZE DISTRIBUTION CURVE
ASTM D 6913

Client Name:	Langan Engineering	Tested by:	SM	Date:	08/22/24
Project Name:	Prospect Ave & 17th Street	Computed by:	JG	Date:	08/23/24
Project No.:	7E+08	Checked by:	AP	Date:	08/23/24



Symbol	Boring No.	Sample No.	Sample Depth (feet)	Percent			Atterberg Limits LL:PL:PI	Soil Type U.S.C.S
				Gravel	Sand	Silt & Clay		
○	LB-1	B-1	0-5	9	28	63	N/A	CL*
□	LB-2	B-1	0-5	9	46	45	N/A	SC*
△	LB-2	S-2	7-5	46	48	6	N/A	SW-SM

*Note: The plasticity is based on visual classification of sample

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GRAIN SIZE DISTRIBUTION CURVE
ASTM D 6913

Client Name:	Langan Engineering	Tested by:	SM	Date:	08/22/24
Project Name:	Prospect Ave & 17th Street	Computed by:	JG	Date:	08/23/24
Project No.:	7E+08	Checked by:	AP	Date:	08/23/24

Symbol	Boring No.	Sample No.	Sample Depth (feet)	Percent			Atterberg Limits LL:PL:PI	Soil Type U.S.C.S
				Gravel	Sand	Silt & Clay		
○	LB-3	B-1	0-5	13	45	42	N/A	SC*

*Note: The plasticity is based on visual classification of sample.

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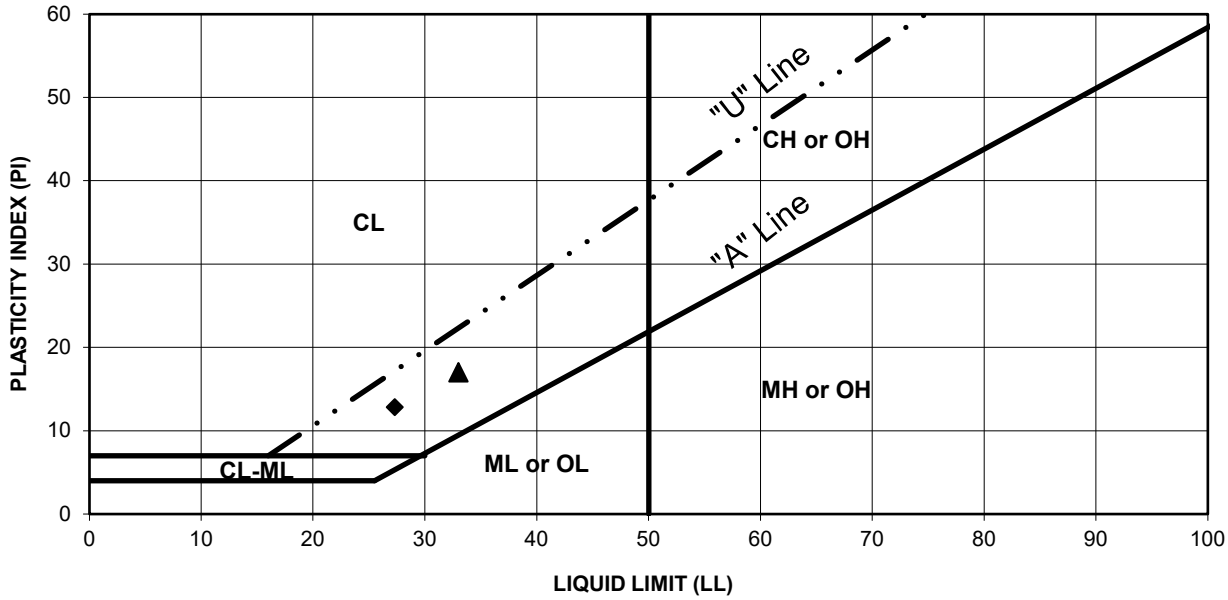
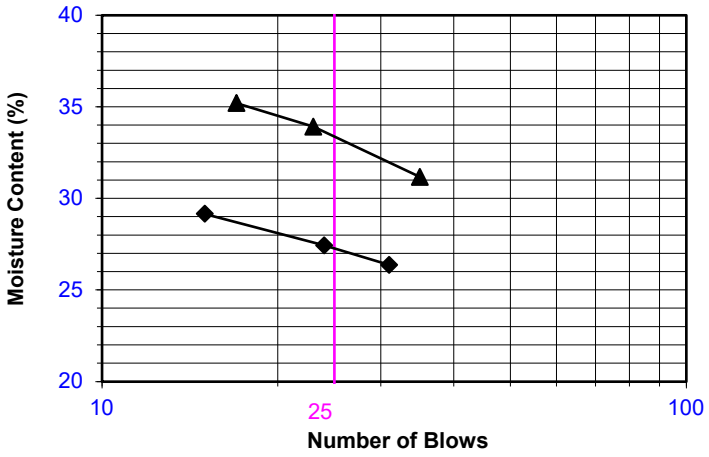
ATTERBERG LIMITS
ASTM D 4318

Client Name:	Langan Engineering	Tested By:	DK	Date:	08/21/24
Project Name:	Prospect Ave & 17th Street	Computed By:	JG	Date:	08/22/24
Project No.:	700159001	Checked By:	AP	Date:	08/23/24



PROCEDURE USED

- ☐ Wet Preparation
- ☒ Dry Preparation
- ☒ Procedure A Multipoint Test
- ☐ Procedure B One-point Test



Symbol	Boring Number	Sample Number	Depth (feet)	LL	PL	PI	Plasticity Chart Symbol
♦	LB-2	S-1	5	27	14	13	CL
▲	LB-2	S-5	20	33	16	17	CL

AP Engineering and Testing, Inc.
DBE|MBE|SBE
2607 Pomona Boulevard | Pomona, CA 91768
t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com

EXPANSION INDEX TEST RESULTS

ASTM D 4829

Client Name: Langan Engineering
Project Name: Prospect Avenue & 17th Street
Project No.: 700159001

AP Job No.: 24-0847
Date: 08/21/24

Boring No.	Sample No.	Depth (ft)	Soil Description	Molded Dry Density (pcf)	Molded Moisture Content (%)	Init. Degree Saturation (%)	Measured Expansion Index	Corrected Expansion Index
LB-1& LB-2	S-1	5	Sandy Clay	119.5	7.7	50.8	21	21

ASTM EXPANSION CLASSIFICATION

Expansion Index	Classification
0-20	V. Low
21-50	Low
51-90	Medium
91-130	High
>130	V. High

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CORROSION TEST RESULTS

Client Name: Langan Engineering
Project Name: Prospect Avenue & 17th Street
Project No.: 700159001

AP Job No.: 24-0847
Date: 08/21/24

Boring No.	Sample No.	Depth (feet)	Soil Description	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
LB-1	B-1	0-5	Sandy Clay	2,043	8.3	43	27

NOTES: Resistivity Test and pH: California Test Method 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

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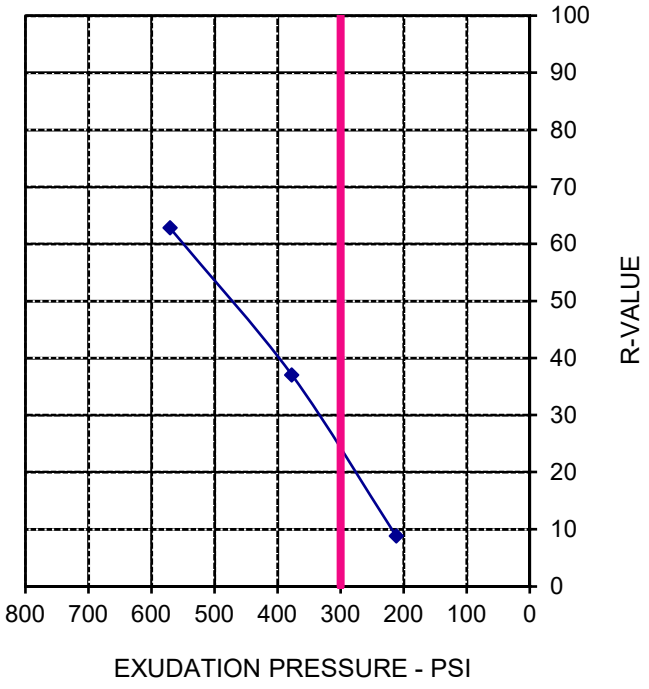
R-VALUE TEST DATA

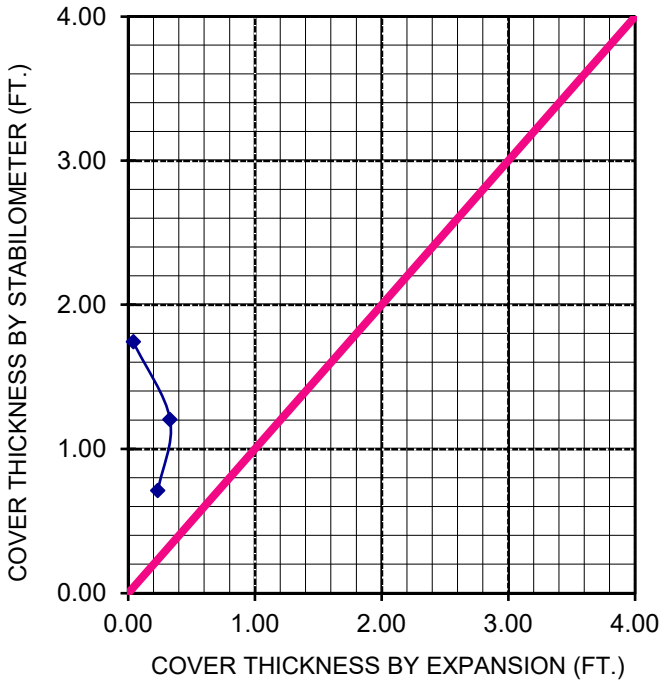
ASTM D2844

Project Name:	Prospect Ave & 17th Street		Tested By:	ST	Date: 08/16/24
Project Number:	700159001		Computed By:	KM	Date: 08/20/24
Source:	LB-1		Checked By:	AP	Date: 08/23/24
Sample No.:	B-1	Depth (ft.): 0-5			
Location:	N/A				
Soil Description:	Sandy Clay				

Mold Number	G	H	I	
Water Added, g	0	-29	-39	
Compact Moisture(%)	16.3	13.3	12.3	
Compaction Gage Pressure, psi	75	275	300	
Exudation Pressure, psi	212	377	570	
Sample Height, Inches	2.5	2.5	2.5	
Gross Weight Mold, g	2920	2932	2916	
Tare Weight Mold, g	1826	1836	1818	
Net Sample Weight, g	1094	1097	1098	
Expansion, inchesx10^{-4}	12	99	70	
Stability 2,000 (160 psi)	57/135	30/80	15/43	
Turns Displacement	4.80	4.25	4.03	
R-Value Uncorrected	9	37	63	
R-Value Corrected	9	37	63	
Dry Density, pcf	114.0	117.3	118.5	
Traffic Index	8.0	8.0	8.0	
G.E. by Stability	1.74	1.20	0.71	
G.E. by Expansion	0.04	0.33	0.23	

R-VALUE	By Exudation:	24
	By Expansion:	*N/A
	At Equilibrium: (by Exudation)	24
Remarks	Gf = 1.34, and 6.1 % Retained on the ¾" *Not Applicable	





APPENDIX D

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Please also see the new USGS Earthquake Hazard Toolbox for access to the most recent NSHMs for the conterminous U.S. and Hawaii.

Earthquake Hazard and Probability Maps

Input

Edition

Dynamic: Conterminous U.S. 2014 (update) (unknown)

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

33.759

Time Horizon

Return period in years

2475

Longitude

Decimal degrees, negative values for western longitudes

-117.821

2% in 50 years
(2,475 years)

5% in 50 years
(975 years)

10% in 50 years
(475 years)

Choose location using a map

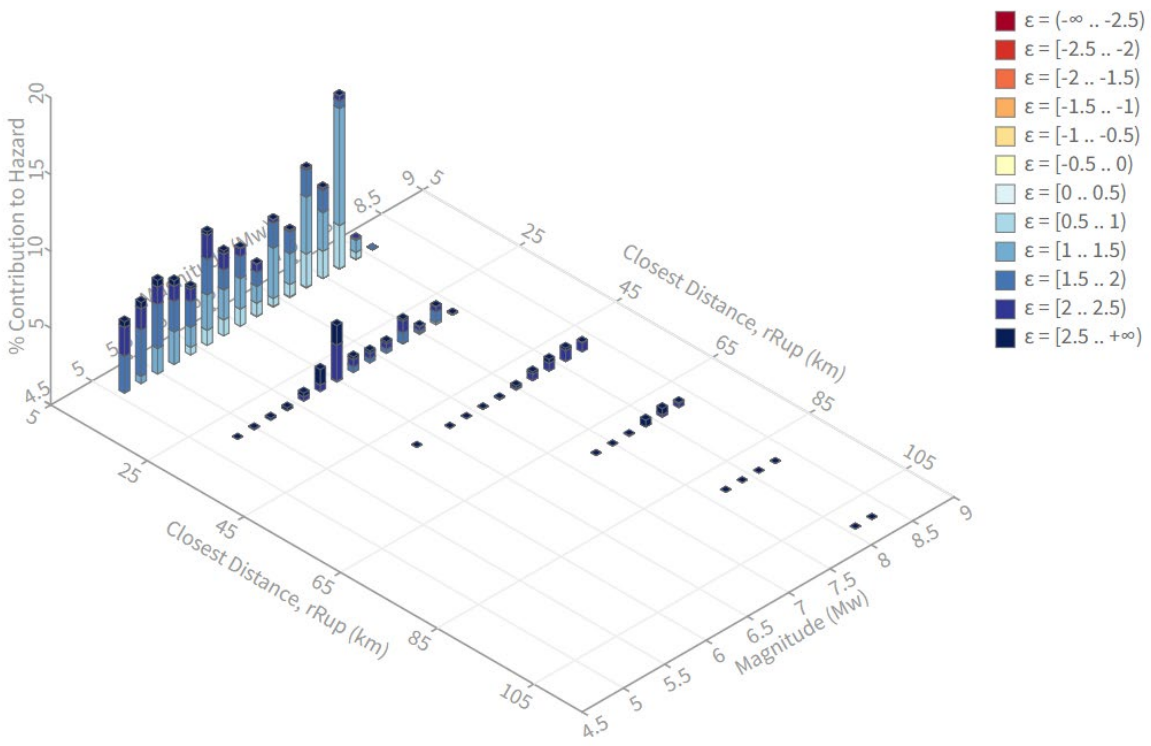
Site Class

259 m/s (Site class D)

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.65222781 g

Recovered targets

Return period: 3079.3612 yrs
Exceedance rate: 0.00032474268 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.06 %

Mean (over all sources)

m: 6.63
r: 15.31 km
ε_0: 1.62 σ

Mode (largest m-r bin)

m: 7.71
r: 14.42 km
ε_0: 1.2 σ
Contribution: 11.27 %

Mode (largest m-r-ε_0 bin)

m: 7.71
r: 15.64 km
ε_0: 1.3 σ
Contribution: 7.62 %

Discretization

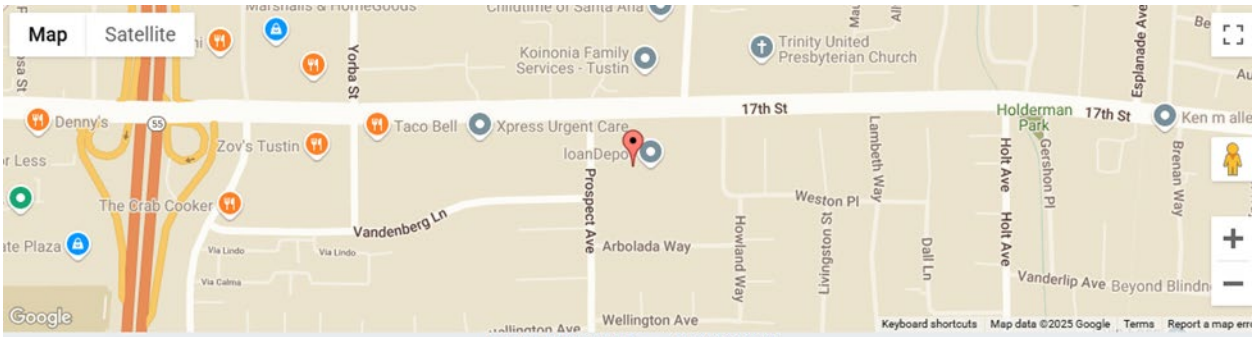
r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ϵ_0	lon	lat	az	%
UC33brAvg_FM32	System							28.55
Whittier alt 2 [2]		16.20	7.59	1.44	117.737°W	33.886°N	28.58	4.22
San Joaquin Hills [1]		10.65	7.19	1.18	117.835°W	33.668°N	187.53	4.21
Compton [0]		17.72	7.28	1.18	118.043°W	33.702°N	253.05	2.60
Elsinore (Glen Ivy) rev [0]		22.76	6.58	2.41	117.590°W	33.829°N	69.93	2.34
Peralta Hills [0]		8.68	7.32	1.02	117.814°W	33.835°N	4.43	2.32
Newport-Inglewood alt 2 [1]		18.23	7.51	1.55	117.974°W	33.657°N	231.40	1.67
Chino alt 2 [2]		20.56	7.01	1.88	117.634°W	33.882°N	51.46	1.66
Anaheim [0]		12.47	6.94	1.22	117.943°W	33.780°N	281.85	1.33
Richfield [0]		14.57	6.38	1.98	117.837°W	33.885°N	354.19	1.32
UC33brAvg_FM31	System							28.08
Whittier alt 1 [2]		16.26	7.49	1.50	117.740°W	33.888°N	27.45	4.61
San Joaquin Hills [1]		10.65	7.54	1.00	117.835°W	33.668°N	187.53	3.48
Peralta Hills [0]		8.68	6.96	1.24	117.814°W	33.835°N	4.43	2.66
Compton [0]		17.72	7.23	1.20	118.043°W	33.702°N	253.05	2.43
Elsinore (Glen Ivy) rev [0]		22.76	6.60	2.40	117.590°W	33.829°N	69.93	2.31
Chino alt 1 [4]		17.64	6.79	1.91	117.629°W	33.876°N	53.66	1.96
Newport-Inglewood alt 1 [0]		18.31	7.49	1.56	117.976°W	33.658°N	231.96	1.77
Anaheim [0]		12.47	6.89	1.25	117.943°W	33.780°N	281.85	1.30
UC33brAvg_FM32 (opt)	Grid							21.71
PointSourceFinite: -117.821, 33.799		6.75	5.65	1.35	117.821°W	33.799°N	0.00	3.07
PointSourceFinite: -117.821, 33.799		6.75	5.65	1.35	117.821°W	33.799°N	0.00	3.07
PointSourceFinite: -117.821, 33.817		7.73	5.85	1.42	117.821°W	33.817°N	0.00	2.45
PointSourceFinite: -117.821, 33.817		7.73	5.85	1.42	117.821°W	33.817°N	0.00	2.45
PointSourceFinite: -117.821, 33.835		9.07	5.89	1.59	117.821°W	33.835°N	0.00	1.52
PointSourceFinite: -117.821, 33.835		9.07	5.89	1.59	117.821°W	33.835°N	0.00	1.52
PointSourceFinite: -117.821, 33.871		11.74	6.06	1.81	117.821°W	33.871°N	0.00	1.38
PointSourceFinite: -117.821, 33.871		11.74	6.06	1.81	117.821°W	33.871°N	0.00	1.38
PointSourceFinite: -117.821, 33.844		10.14	5.78	1.76	117.821°W	33.844°N	0.00	1.07
PointSourceFinite: -117.821, 33.844		10.14	5.78	1.76	117.821°W	33.844°N	0.00	1.07
UC33brAvg_FM31 (opt)	Grid							21.65
PointSourceFinite: -117.821, 33.799		6.75	5.65	1.35	117.821°W	33.799°N	0.00	2.98
PointSourceFinite: -117.821, 33.799		6.75	5.65	1.35	117.821°W	33.799°N	0.00	2.98
PointSourceFinite: -117.821, 33.817		7.72	5.86	1.41	117.821°W	33.817°N	0.00	2.43
PointSourceFinite: -117.821, 33.817		7.72	5.86	1.41	117.821°W	33.817°N	0.00	2.43
PointSourceFinite: -117.821, 33.835		9.06	5.89	1.58	117.821°W	33.835°N	0.00	1.56
PointSourceFinite: -117.821, 33.835		9.06	5.89	1.58	117.821°W	33.835°N	0.00	1.56
PointSourceFinite: -117.821, 33.871		11.71	6.07	1.81	117.821°W	33.871°N	0.00	1.42
PointSourceFinite: -117.821, 33.871		11.71	6.07	1.81	117.821°W	33.871°N	0.00	1.42
PointSourceFinite: -117.821, 33.844		10.07	5.81	1.74	117.821°W	33.844°N	0.00	1.13
PointSourceFinite: -117.821, 33.844		10.07	5.81	1.74	117.821°W	33.844°N	0.00	1.13



Lat: 33.75891313, Lng: -117.82164401

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error. USGS web services are now operational so this tool should work as expected.

Search for Address or Coordinates

Reference: ASCE 7-16 | Risk Category: II | Site Class: D - Stiff Soil

Project Title (optional)

Address | Coords: 33.75891313, -117.82164401 Go

Latitude, Longitude: 33.75891313, -117.82164401 Print

Date	2/19/2025, 9:57:45 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.311	MCE_R ground motion. (for 0.2 second period)
S_1	0.468	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.311	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	0.874	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.529	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.582	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.311	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.402	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.468	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.504	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.529	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.547	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.935	Mapped value of the risk coefficient at short periods
C_{R1}	0.928	Mapped value of the risk coefficient at a period of 1 s
C_V	1.362	Vertical coefficient

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APPENDIX E

APPENDIX E

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

1.0 General

1.1 Intent: These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 Geotechnical Consultant: Prior to commencement of work, the owner shall employ a geotechnical consultant. The geotechnical consultant shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During the grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include natural ground after it has been cleared for receiving fill but before fill is placed, bottoms of all "remedial removal" areas, all key bottoms, and benches made on sloping ground to receive fill.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to determine the attained level of compaction. The Geotechnical Consultant shall provide the test results to the owner and the Contractor on a routine and frequent basis.

1.3 The Earthwork Contractor: The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the plans and specifications.

The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" of work and the estimated quantities of daily earthwork contemplated for the site prior to commencement of grading. The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are rectified.

2.0 Preparation of Areas to be Filled

2.1 Clearing and Grubbing: Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant.

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 5 percent of organic matter. Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

2.2 Processing: Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

2.3 Overexcavation: In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be overexcavated to competent ground as evaluated by the Geotechnical Consultant during grading.

2.4 Benching: Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. Please see the Standard Details for a graphic illustration. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise overexcavated to provide a flat subgrade for the fill.

2.5 Evaluation/Acceptance of Fill Areas: All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

3.0 Fill Material

3.1 General: Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 Oversize: Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 12 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

3.3 Import: If importing of fill material is required for grading, proposed import material shall meet the requirements of Section 3.1. The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate tests performed.

4.0 Fill Placement and Compaction

4.1 Fill Layers: Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 Fill Moisture Conditioning: Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM Test Method D1557-91).

4.3 Compaction of Fill: After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557-91). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

4.4 Compaction of Fill Slopes: In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557-91.

4.5 Compaction Testing: Field tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

4.6 Frequency of Compaction Testing: Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soils embankment. In addition, as a guideline, at least one test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.7 Compaction Test Locations: The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided.

5.0 Subdrain Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and the Standard Details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

6.0 Excavation

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

7.0 Trench Backfills

7.1 Contractor shall follow all OHSA and Cal/OSHA requirements for safety of trench excavations.

7.2 Bedding and backfill of utility trenches shall be done in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum 90 percent of maximum from 1 foot above the top of the conduit to the surface, except in traveled ways (see Section 7.6 below).

7.3 Jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.

7.4 Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

7.5 Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

7.6 Trench backfill in the upper foot measured from finish grade/subgrade within existing or future traveled way, shoulder, and other paved areas (or areas to receive pavement) should be placed to a minimum 95 percent relative compaction unless specified differently by the governing agency.

Attachment F

Hydrology Calculations

TTM 19390
Prospect Avenue and 17th Street
Tustin, CA

HCOC Calculations

2-Year, 24-hour storm even volume and Time of Concentration calculations were derived from the Orange County Hydrology Manual. The following equations were utilized:

$V_{2\text{-YEAR}} = C(D)(A)$

C = Runoff Coefficient
D = Mean Precipitation Depth for 24 Hours
A = Area

C = 0.90(a_i), for Intensities (I) less than or equal to F_P *
- a_i = Ratio of Impervious areas to total area
- F_P = Infiltration Rate for Pervious areas = 0.40

* Refer to Orange County Hydrology Manual Section C.6.4

Intensity:

$I(t) = a(t^b)$
- a = 5.702
- t = 1,440 minutes (24 hours)
- b = -0.574

$I(t = 1440) = 5.702(1440^{-0.574}) = \mathbf{0.0877}$

Depth:

$D(t) = a(t^b)$
- a = 0.095
- t = 1,440 minutes (24 hours)
- b = 0.426

$D(t = 1440) = 0.095(1{,}440^{0.426}) = \mathbf{2.104\ in}$

Existing Conditions
Total Area = 8.54 ac (372,169 sf)

a_i = 0.89
C = 0.90(0.42) = 0.801

$V_{2\text{-YEAR-PRE}}$ = 0.801(2.104 in)(372,169 sf)(1 ft/12 in) = **52,268.16 cf**

Proposed Conditions
Total Area = 8.54 ac (372,169 sf)

a_i = 0.85
C = 0.90(0.85) = 0.765

$V_{2\text{-YEAR-POST}}$ = 0.765(2.104 in)(372,169 sf)(1 ft/12 in) = **49,919.03 cf**

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018 Version 9.0
Rational Hydrology Study, Date: 02/20/25 File Name: BAR01X02.roc

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VTTM 19390
TUSTIN
EXISTING Q02
KBAR-001

Program License Serial Number 6677

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 2.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++

Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fp)= 0.400(In/Hr)
Max Catchment Loss (Fm) = 0.040(In/Hr)
Initial subarea data:
Initial area flow distance = 76.000(Ft.)
Top (of initial area) elevation = 162.200(Ft.)
Bottom (of initial area) elevation = 161.900(Ft.)
Difference in elevation = 0.300(Ft.)
Slope = 0.00395 s(%)= 0.39
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.199 min.
Rainfall intensity = 2.213(In/Hr) for a 2.0 year storm

```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.884
Subarea runoff =      0.352(CFS)
Total initial stream area =        0.180(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   161.900(Ft.)
Downstream point elevation =   160.400(Ft.)
Channel length thru subarea  =  1075.500(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   0.000
Slope or 'Z' of right channel bank =   0.000
Estimated mean flow rate at midpoint of channel =      5.528(CFS)
Manning's 'N'    = 0.013
Maximum depth of channel  =    0.130(Ft.)
Flow(q) thru subarea =      5.528(CFS)
Depth of flow =   0.624(Ft.), Average velocity =   2.951(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =    3.000(Ft.)
Flow Velocity =    2.95(Ft/s)
Travel time  =    6.07 min.
Time of concentration =   11.27 min.
Critical depth =      0.473(Ft.)
ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1000  Max loss rate(Fp)=     0.400(In/Hr)
Max Catchment Loss (Fm) =     0.040(In/Hr)
Rainfall intensity =      1.420(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.875
Subarea runoff =     10.263(CFS) for    8.370(Ac.)
Total runoff =     10.615(CFS)  Total area =        8.55(Ac.)
Area averaged Fm value =    0.040(In/Hr)
Depth of flow =   0.924(Ft.), Average velocity =   3.831(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth
Critical depth =      0.734(Ft.)
End of computations, total study area =            8.55 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
```

Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged SCS curve number (AMC 2) = 32.0

Orange County Rational Hydrology Program

(Hydrology Manual Date(s) October 1986 & November 1996)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018 Version 9.0
Rational Hydrology Study, Date: 02/20/25 File Name: BAR01P02.roc

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VTTM 19390
TUSTIN
PROPOSED Q02
KBAR-001

Program License Serial Number 6677

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 2.0

Decimal fraction of study above 2000 ft., 600M = 0.0000
English Units Used for input data

++

Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

CONDOMINIUM subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.3500 Max loss rate(Fp)= 0.400(In/Hr)
Max Catchment Loss (Fm) = 0.140(In/Hr)
Initial subarea data:
Initial area flow distance = 85.000(Ft.)
Top (of initial area) elevation = 163.590(Ft.)
Bottom (of initial area) elevation = 163.080(Ft.)
Difference in elevation = 0.510(Ft.)
Slope = 0.00600 s(%)= 0.60
TC = k(0.360)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 5.922 min.
Rainfall intensity = 2.054(In/Hr) for a 2.0 year storm

```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.839
Subarea runoff =      0.276(CFS)
Total initial stream area =        0.160(Ac.)
```



```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =   163.080(Ft.)
End of street segment elevation =   161.470(Ft.)
Length of street segment  =   921.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  28.000(Ft.)
Distance from crown to crossfall grade break  =  26.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =   5.500(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.125(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      3.835(CFS)
Depth of flow =   0.327(Ft.), Average velocity =   1.284(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.327(Ft.)
Flow velocity =   1.28(Ft/s)
Travel time =   11.96 min.     TC =   17.88  min.
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.3500  Max loss rate(Fp)=     0.400(In/Hr)
Max Catchment Loss (Fm) =     0.140(In/Hr)
Rainfall intensity =      1.089(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.784
Subarea runoff =      7.021(CFS) for    8.380(Ac.)
Total runoff =      7.297(CFS)  Total area =        8.54(Ac.)
Area averaged Fm value =    0.140(In/Hr)
Street flow at end of street =      7.297(CFS)
Half street flow at end of street =      7.297(CFS)
Depth of flow =   0.421(Ft.), Average velocity =   1.506(Ft/s)
```

Flow width (from curb towards crown)= 22.048(Ft.)
End of computations, total study area = 8.54 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.350
Area averaged SCS curve number (AMC 2) = 32.0

Attachment G

City Covenant

[To Be Used for projects not involving land subdivisions]

RECORDING REQUESTED BY AND WHEN RECORDED MAIL TO:

Building Official
City of Tustin
300 Centennial Way
Tustin, CA 92780-3767

Space Above This Line For Recorder's Use Only

COVENANT AND AGREEMENT REGARDING O & M PLAN TO FUND AND MAINTAIN WATER QUALITY BMPS, CONSENT TO INSPECT, AND INDEMNIFICATION

This Covenant and Agreement Regarding O&M Plan to Fund and Maintain Water Quality BMPs, Consent to Inspect, and Indemnification and Covenant Running With the Land ("Agreement") is made on this ___ day of _____, 20__, by and between The City of Tustin, a California municipal corporation ("Covenantee" or "City") and the undersigned property owner(s) ("Covenantor").

RECITALS

A. Covenantor is the owner of the following real property ("Property") [Provide Address, Legal Description and APN Number]):

APN: 401-401-12, 401-401-13, 401-401-14, 401-401-15, 401-401-16, 401-401-17

THE LAND REFERRED TO HEREIN IS SITUATED IN THE STATE OF CALIFORNIA, COUNTY OF ORANGE, CITY OF TUSTIN AND DESCRIBED AS FOLLOWS: LOTS 1 TO 5 INCLUSIVE AND LOT A, OF TRACT NO. 17342, IN THE CITY OF TUSTIN COUNTY OF ORANGE, STATE OF CALIFORNIA, AS PER MAP RECORDED NOVEMBER 4, 2011 IN BOOK 906, PAGES 44 TO 47 INCLUSIVE OF MAPS IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

B. The City is the owner of interests in that certain real property within the City of Tustin, County of Orange, State of California, containing storm drains, pipelines, and related appurtenances constituting the City's municipal separate storm sewer system (the City's "Storm Drain System").

C. Covenantor intends to develop, improve, and/or use the Property in such a way that approval of the City for such development, improvement, and/or use is required pursuant to the applicable laws.

D. As a condition for said approval by the City, City required Covenantor, and Covenantor desires to, restrict the use of Property according to the conditions, covenants,

equitable servitudes, and restrictions contained herein for the express benefit of the City's Storm Drain System.

NOW, THEREFORE, incorporating the foregoing Recitals and in consideration thereof, in consideration of the covenants and conditions contained herein, and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, and expressly for the benefit of, and to bind, their successors in interest, the parties hereto agree as follows:

AGREEMENT

1. Operation and Maintenance ("O&M") Plan for Best Management Practices ("BMPs")

Covenantor, and each successive owner of an interest in all or any part of the Property ("Owner(s)") shall, throughout the period of their respective ownership, implement, and fund implementation of, the O&M Plan for the Property, which was approved by the City as part of the Water Quality Management Plan ("WQMP") required for development of the Property, and shall operate, inspect, maintain, repair, and replace the Best Management Practices ("BMPs") described in the O&M Plan for the Property, which includes:

a. Description of all post-construction BMPs (non-structural and structural),
b. Description of the Property owner's(s') responsibilities and required training of persons performing BMP implementation, operation, maintenance, and inspection,
c. Implementation frequency and operating schedule,
d. Inspection/maintenance frequency and schedule,
e. Specific BMP implementation, maintenance, and inspection activities,
f. Description of all permits required for the implementation, operation, and maintenance of BMPs,
g. Forms to be used in documenting implementation, operation, maintenance, and inspection of BMPs,
h. Recordkeeping requirements.

A copy of the approved O&M Plan is described in the current WQMP for the project, as it may be amended from time to time according to its terms, which is on file with the City of Tustin Community Development Department, and is incorporated herein by this reference.

2. Compliance with Tustin City Code and Consent to Inspect

Owners shall use and maintain the Property in full compliance with the provisions of the O&M Plan and the Tustin City Code section 4900 et seq., as it may be amended from time to time. Owners hereby consent to inspection of the Property by an inspector authorized by the City Manager, or his or her designee, for the purpose for verifying compliance with the provisions of this Agreement.

3. Indemnification

Owners agree to indemnify, defend, and hold harmless the City, its elected officers, employees, agents, and contractors from and against any and all liability, expense, including costs and legal fees, and claims of damage of any nature whatsoever including, but not limited to, death, bodily injury, personal injury, or property damage arising from or connected with the City inspection of the Property except where such liability, expense, or claim for damage results from the sole negligence or willful misconduct of the City its elected officers, employees, agents, or contractors.

4. Rights and Obligations Run With the Land

Unless terminated in accordance with Paragraph 5, below, or by law, the rights and obligations of the parties hereunder shall constitute covenants, benefits, burdens, conditions, equitable servitudes, and restrictions which run with the land in perpetuity and which shall be binding upon, and inure to the benefit of, each Owner during its respective period of ownership of all or any part of the Property. No Owner shall be bound by, or entitled to the benefit of, said rights and obligations, upon transfer by the Owner of its entire interest in the Property, in fee, to a successor in interest to the Property.

5. Termination of Agreement Upon Termination of WQMP

This Agreement and the conditions, covenants, equitable servitudes, and restrictions set forth herein shall terminate upon termination of the WQMP applicable to the Property in accordance with its terms. Upon termination of the WQMP applicable to the Property, the Owner may request that the City execute a recordable document approved by the City approving and acknowledging termination of this Agreement. A recorded document duly executed and acknowledged by the Director of Community Development of City, or his or her designee, approving termination of this Agreement shall be conclusive evidence of such termination.

6. Enforcement

The City may, but shall not be obligated to, enforce this Agreement by a proceeding at law or in equity against any person or persons violating or attempting to violate any condition, covenant, equitable servitude, or restriction provided for herein, either to restrain such violation or to recover damages.

7. Entire Agreement.

This Agreement constitutes the entire agreement and understanding between the parties with respect of the subject matter of this Agreement and supersedes all prior or contemporaneous agreements and understandings with respect to the subject matter hereof, whether oral or written.

8. Severability.

If any part of this Agreement is declared by a final decision of a court of competent jurisdiction to be invalid for any reason, such shall not affect the validity of the rest of the Agreement. The other parts of this Agreement shall remain in effect as if this Agreement had been executed without the invalid part. The parties declare that they intend and desire that the remaining parts of this Agreement continue to be effective without any part or parts that have been declared invalid.

9. Counterparts.

This Agreement may be executed in counterparts, each of which so executed shall, irrespective of the date of its execution and delivery, be deemed an original, and all such counterparts together shall constitute one and the same instrument.

10. Attorneys' Fees.

If any party files an action or brings any proceeding against the other arising from this Agreement, the prevailing party shall be entitled to recover as an element of its costs of suit, and not as damages, reasonable attorneys' fees and costs to be fixed by the court. A party not entitled to recover its costs shall not recover attorneys' fees. No sum for attorneys' fees shall be included in calculating the amount of a judgment for purposes of deciding whether a party is entitled to its costs or attorneys' fees.

11. Amendment.

No modification, amendment, addition to, or alteration of the terms of this Agreement whether written or verbal, shall be valid unless made in writing, formally approved and executed by the City and the current Owner(s) of the Property, and duly recorded.

12. Authority of Signatories to Agreement.

Each person executing this Agreement represents and warrants that he or she is duly authorized and has legal capacity to execute and deliver this Agreement on behalf of the parties for which execution is made. Each party represents and warrants to the other that the execution of this Agreement and the performance of such party's obligations hereunder have been duly authorized and that the agreement is a valid and legal agreement binding on such party and enforceable in accordance with its terms.

[*SIGNATURES ON FOLLOWING PAGE*]

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the date set forth above.

"CITY" / "COVENANTEE"
CITY OF TUSTIN

_____
Mariam Madjlessi, P.E.
Deputy Building Official

ATTEST:

_____
Erica N. Yasuda, City Clerk

APPROVED AS TO FORM:

_____
David Kendig, City Attorney

"COVENANTOR"

_____
Name of Covenantor

_____
Signature

_____
Title

_____
Signature

_____
Title

[Signatures to be Notarized]

ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of _____)

On _____ before me_____
(insert name and title of the officer)

personally appeared _____,
who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature _____**(Seal)**

Attachment H

Conditions of Approval

To be provided during final engineering

Attachment I

Engineer’s Certification Form

To be provided during final engineering

Attachment H

Educational Materials

The Ocean Begins at Your Front Door

Never allow pollutants to enter the

street, gutter or storm drain!

Follow these simple steps to help reduce water pollution:

Household Activities

- Do not rinse spills with water. Use dry cleanup methods such as applying cat litter or another absorbent material, sweep and dispose of in the trash. Take items such as used or excess batteries, oven cleaners, automotive fluids, painting products and cathode ray tubes, like TVs and computer monitors, to a Household Hazardous Waste Collection Center (HHWCC).
- For a HHWCC near you call (714) 834-6752 or visit www.oclandfills.com.
- Do not hose down your driveway, sidewalk or patio to the street, gutter or storm drain. Sweep up debris and dispose of it in the trash.

Automotive

- Take your vehicle to a commercial car wash whenever possible. If you wash your vehicle at home, choose soaps, cleaners, or detergents labeled non-toxic, phosphate- free or biodegradable. Vegetable and citrus-based products are typically safest for the environment.
- Do not allow washwater from vehicle washing to drain into the street, gutter or storm drain. Excess washwater should be disposed of in the sanitary sewer (through a sink or toilet) or onto an absorbent surface like your lawn.
- Monitor your vehicles for leaks and place a pan under leaks. Keep your vehicles well maintained to stop and prevent leaks.
- Never pour oil or antifreeze in the street, gutter or storm drain. Recycle these substances at a service station, a waste oil collection center or used oil recycling center. For the nearest Used Oil Collection Center call 1-800-CLEANUP or visit www.1800cleanup.org.

Pool Maintenance

- Pool and spa water must be dechlorinated and free of excess acid, alkali or color to be allowed in the street, gutter or storm drain.
- When it is not raining, drain dechlorinated pool and spa water directly into the sanitary sewer.
- Some cities may have ordinances that do not allow pool water to be disposed of in the storm drain. Check with your city.

Landscape and Gardening

- Do not over-water. Water your lawn and garden by hand to control the amount of water you use or set irrigation systems to reflect seasonal water needs. If water flows off your yard onto your driveway or sidewalk, your system is over-watering. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of waste by composting, hauling it to a permitted landfill, or as green waste through your city's recycling program.
- Follow directions on pesticides and fertilizer, (measure, do not estimate amounts) and do not use if rain is predicted within 48 hours.
- Take unwanted pesticides to a HHWCC to be recycled. For locations and hours of HHWCC, call (714) 834-6752 or visit www.oclandfills.com.

Trash

- Place trash and litter that cannot be recycled in securely covered trash cans.
- Whenever possible, buy recycled products.
- Remember: Reduce, Reuse, Recycle.

Pet Care

- Always pick up after your pet. Flush waste down the toilet or dispose of it in the trash. Pet waste, if left outdoors, can wash into the street, gutter or storm drain.
- If possible, bathe your pets indoors. If you must bathe your pet outside, wash it on your lawn or another absorbent/permeable surface to keep the washwater from entering the street, gutter or storm drain.
- Follow directions for use of pet care products and dispose of any unused products at a HHWCC.

Common Pollutants

Home Maintenance

- Detergents, cleaners and solvents
- Oil and latex paint
- Swimming pool chemicals
- Outdoor trash and litter

Lawn and Garden

- Pet and animal waste
- Pesticides
- Clippings, leaves and soil
- Fertilizer

Automobile

- Oil and grease
- Radiator fluids and antifreeze
- Cleaning chemicals
- Brake pad dust

Even if you live miles from the Pacific Ocean, you may be unknowingly polluting it.

Dumping one quart of motor oil into a storm drain can contaminate 250,000 gallons of water.

Did You Know?

- Most people believe that the largest source of water pollution in urban areas comes from specific sources such as factories and sewage treatment plants. In fact, the largest source of water pollution comes from city streets, neighborhoods, construction sites and parking lots. This type of pollution is sometimes called “non-point source” pollution.
- There are two types of non-point source pollution: stormwater and urban runoff pollution.
- Stormwater runoff results from rainfall. When rainstorms cause large volumes of water to rinse the urban landscape, picking up pollutants along the way.
- Urban runoff can happen any time of the year when excessive water use from irrigation, vehicle washing and other sources carries trash, lawn clippings and other urban pollutants into storm drains.

Where Does It Go?

- Anything we use outside homes, vehicles and businesses – like motor oil, paint, pesticides, fertilizers and cleaners – can be blown or washed into storm drains.
- A little water from a garden hose or rain can also send materials into storm drains.
- Storm drains are separate from our sanitary sewer systems; unlike water in sanitary sewers (from sinks or toilets), water in storm drains is not treated before entering our waterways.

Sources of Non-Point Source Pollution

- Automotive leaks and spills.
- Improper disposal of used oil and other engine fluids.
- Metals found in vehicle exhaust, weathered paint, rust, metal plating and tires.
- Pesticides and fertilizers from lawns, gardens and farms.
- Improper disposal of cleaners, paint and paint removers.
- Soil erosion and dust debris from landscape and construction activities.
- Litter, lawn clippings, animal waste, and other organic matter.
- Oil stains on parking lots and paved surfaces.

The Effect on the Ocean

Non-point source pollution can have a serious impact on water quality in Orange County. Pollutants from the storm drain system can harm marine life as well as coastal and wetland habitats. They can also degrade recreation areas such as beaches, harbors and bays.

Stormwater quality management programs have been developed throughout Orange County to educate and encourage the public to protect water quality, monitor runoff in the storm drain system, investigate illegal dumping and maintain storm drains.

Support from Orange County residents and businesses is needed to improve water quality and reduce urban runoff pollution. Proper use and disposal of materials will help stop pollution before it reaches the storm drain and the ocean.

For More Information

California Environmental Protection Agency
www.calepa.ca.gov

- **Air Resources Board**
  www.arb.ca.gov
- **Department of Pesticide Regulation**
  www.cdpr.ca.gov
- **Department of Toxic Substances Control**
  www.dtsc.ca.gov
- **Integrated Waste Management Board**
  www.ciwmb.ca.gov
- **Office of Environmental Health Hazard Assessment**
  www.oehha.ca.gov
- **State Water Resources Control Board**
  www.waterboards.ca.gov

Earth 911 - Community-Specific Environmental Information 1-800-cleanup or visit www.1800cleanup.org

Health Care Agency's Ocean and Bay Water Closure and Posting Hotline
(714) 433-6400 or visit www.ocbeachinfo.com

Integrated Waste Management Dept. of Orange County (714) 834-6752 or visit www.oclandfills.com for information on household hazardous waste collection centers, recycling centers and solid waste collection

O.C. Agriculture Commissioner
(714) 447-7100 or visit www.ocagcomm.com

Stormwater Best Management Practice Handbook
Visit www.cabmphandbooks.com

UC Master Gardener Hotline
(714) 708-1646 or visit www.uccemg.com

The Orange County Stormwater Program has created and moderates an electronic mailing list to facilitate communications, take questions and exchange ideas among its users about issues and topics related to stormwater and urban runoff and the implementation of program elements. To join the list, please send an email to ocstormwaterinfo-join@list.ocwatersheds.com

Orange County Stormwater Program

Aliso Viejo	(949)	425-2535
Anaheim Public Works Operations	(714)	765-6860
Brea Engineering	(714)	990-7666
Buena Park Public Works	(714)	562-3655
Costa Mesa Public Services	(714)	754-5323
Cypress Public Works	(714)	229-6740
Dana Point Public Works	(949)	248-3584
Fountain Valley Public Works	(714)	593-4441
Fullerton Engineering Dept.	(714)	738-6853
Garden Grove Public Works	(714)	741-5956
Huntington Beach Public Works	(714)	536-5431
Irvine Public Works	(949)	724-6315
La Habra Public Services	(562)	905-9792
La Palma Public Works	(714)	690-3310
Laguna Beach Water Quality	(949)	497-0378
Laguna Hills Public Services	(949)	707-2650
Laguna Niguel Public Works	(949)	362-4337
Laguna Woods Public Works	(949)	639-0500
Lake Forest Public Works	(949)	461-3480
Los Alamitos Community Dev.	(562)	431-3538
Mission Viejo Public Works	(949)	470-3056
Newport Beach, Code & Water Quality Enforcement	(949)	644-3215
Orange Public Works	(714)	532-6480
Placentia Public Works	(714)	993-8245
Rancho Santa Margarita	(949)	635-1800
San Clemente Environmental Programs	(949)	361-6143
San Juan Capistrano Engineering	(949)	234-4413
Santa Ana Public Works	(714)	647-3380
Seal Beach Engineering	(562)	431-2527 x317
Stanton Public Works	(714)	379-9222 x204
Tustin Public Works/Engineering	(714)	573-3150
Villa Park Engineering	(714)	998-1500
Westminster Public Works/Engineering	(714)	898-3311 x446
Yorba Linda Engineering	(714)	961-7138
Orange County Stormwater Program	(877)	897-7455

Orange County 24-Hour
Water Pollution Problem Reporting Hotline
1-877-89-SPILL (1-877-897-7455)

On-line Water Pollution Problem Reporting Form
www.ocwatersheds.com

Printed on Recycled Paper

The Ocean Begins at Your Front Door

The Pollution Solution

Several residential activities can result in water pollution. Among these activities are car washing and hosing off driveways and sidewalks. Both activities can waste water and result in excess runoff. Water conservation methods described in this pamphlet can prevent considerable amounts of runoff and conserve water. By taking your car to a commercial car wash and by sweeping driveways and sidewalks, you can further prevent the transport of pollutants to Orange County waterways. Here are some of the common pollutants for which you can be part of the solution:

1 Pesticides and Fertilizer

- **Pollution:** The same pesticides that are designed to be toxic to pests can have an equally lethal impact on our marine life. The same fertilizer that promotes plant growth in lawns and gardens can also create nuisance algae blooms, which remove oxygen from the water and clog waterways when it decomposes.

- **Solution:** Never use pesticides or fertilizer within 48 hours of an anticipated rainstorm. Use only as much as is directed on the label and keep it off driveways and sidewalks.

2 Dirt and Sediment

- **Pollution:** Dirt or sediment can impede the flow of the stormwater and negatively impact stream habitat as it travels through waterways and deposits downstream. Pollutants can attach to sediment, which can then be transported through our waterways.

- **Solution:** Protect dirt stockpiles by covering them with tarps or secure plastic sheets to prevent wind or rain from allowing dirt or sediment to enter the storm drain system.

3 Metals

- **Pollution:** Metals and other toxins present in car wash water can harm important plankton, which forms the base of the aquatic food chain.

- **Solution:** Take your car to a commercial car wash where the wash water is captured and treated at a local wastewater treatment plant.

DID YOU KNOW?

Did you know that most of the pollution found in our waterways is not from a single source, but from a "non-point" source meaning the accumulation of pollution from residents and businesses throughout the community

4 Pet Waste

- **Pollution:** Pet waste carries bacteria through our watersheds and eventually will be washed out to the ocean. This can pose a health risk to swimmers and surfers.

- **Solution:** Pick up after your pets!

5 Trash and Debris

- **Pollution:** Trash and debris can enter waterways by wind, littering and careless maintenance of trash receptacles. Street sweeping collects some of this trash; however, much of what isn't captured ends up in our storm drain system where it flows untreated out to the ocean.

- **Solution:** Don't litter and make sure trash containers are properly covered. It is far more expensive to clean up the litter and trash that ends up in our waterways than it is to prevent it in the first place. Come out to one of Orange County's many locations for Coastal and Inner-Coastal Cleanup Day, which is held in September.

6 Motor Oil / Vehicle Fluids

- **Pollution:** Oil and petroleum products from our vehicles are toxic to people, wildlife and plants.

- **Solution:** Fix any leaks from your vehicle and keep the maintenance up on your car. Use absorbent material such as cat litter on oil spills, then sweep it up and dispose of it in the trash. Recycle used motor oil at a local Household Hazardous Waste Collection Center.

A TEAM EFFORT

The Orange County Stormwater Program has teamed with the Municipal Water District of Orange County (MWDOC) and the University of California Cooperative Extension Program (UCCE) to develop this pamphlet.

Low Impact Development (LID) and sustainable water use prevents water pollution and conserves water for drinking and reuse. Reducing your water use and the amount of water flowing from your home protects the environment and saves you money.

Thank you for making water protection a priority!

For more information, please visit www.ocwatersheds.com/publiced/

www.mwdoc.com

www.uccemg.com

To report a spill, call the Orange County 24-Hour Water Pollution Prevention Reporting Hotline at 1-877-89-SPILL \(1-877-897-7455)

Special Thanks to
The City of Los Angeles Stormwater Program for the use of its artwork

The Metropolitan Water District of Southern California for the use of the California-Friendly Plant and Native Habitat photos

Homeowners Guide for Sustainable Water Use

Low Impact Development, Water Conservation & Pollution Prevention

The Ocean Begins at Your Front Door

RUNOFF, RAINWATER AND REUSE

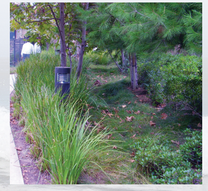
Where Does Water Runoff Go?

Stormwater, or water from rainfall events, and runoff from outdoor water use such as sprinklers and hoses flows from homes directly into catch basins and the storm drain system. After entering the storm drain, the water flows untreated into streams, rivers, bays and ultimately the Pacific Ocean. Runoff can come from lawns, gardens, driveways, sidewalks and roofs. As it flows over hard, impervious surfaces, it picks up pollutants. Some pollutants carried by the water runoff include trash, pet waste, pesticides, fertilizer, motor oil and more.

Water Conservation

Pollution not only impairs the water quality for habitat and recreation, it can also reduce the water available for reuse. Runoff allowed to soak into the ground is cleaned as it percolates through the soil, replenishing depleted groundwater supplies. Groundwater provides at least 50% of the total water for drinking and other indoor household activities in north and central Orange County. When land is covered with roads, parking lots, homes, etc., there is less land to take in the water and more hard surfaces over which the water can flow.

In Orange County, 60-70% of water used by residents and businesses goes to irrigation and other outdoor uses. Reusing rainwater to irrigate our lawn not only reduces the impact of water pollution from runoff, but it also is a great way to conserve our precious water resources and replenish our groundwater basin.



What is Low Impact Development (LID)?

Low Impact Development (LID) is a method of development that seeks to maintain the natural hydrologic character of an area. LID provides a more sustainable and pollution-preventative approach to water management.

New water quality regulations require implementation of LID in larger new developments and encourage implementation of LID and other sustainable practices in existing residential areas. Implementing modifications to your lawn or garden can reduce pollution in our environment, conserve water and reduce your water bill.

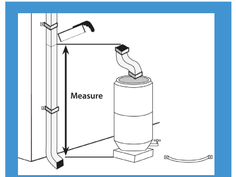
Permeable pavement allows water runoff to infiltrate through the soil and prevents most pollutants from reaching the storm drain system.

OPTIONS FOR RAINWATER HARVESTING AND REUSE

Rainwater harvesting is a great way to save money, prevent pollution and reduce potable water use. To harvest your rainwater, simply redirect the runoff from roofs and downspouts to rain barrels. Rain gardens are another option; these reduce runoff as well as encourage infiltration.

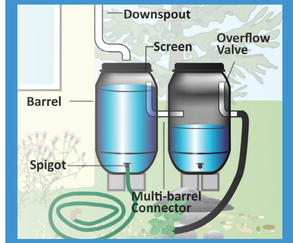
Downspout Disconnection/Redirection

Disconnecting downspouts from pipes running to the gutter prevents runoff from transporting pollutants to the storm drain. Once disconnected, downspouts can be redirected to rain gardens or other vegetated areas, or be connected to a rain barrel.



Rain Barrels

Rain barrels capture rainwater flow from roofs for reuse in landscape irrigation. Capacity of rain barrels needed for your home will depend on the amount of roof area and rainfall received. When purchasing your rain barrel, make sure it includes a screen, a spigot to siphon water for use, an overflow tube to allow for excess water to run out and a connector if you wish to connect multiple barrels to add capacity of water storage.

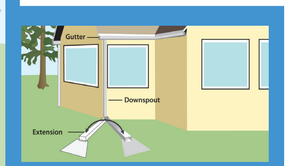


Mosquito growth prevention is very important when installing a rain barrel. The best way to prevent mosquito breeding is to eliminate entry points by ensuring all openings are sealed tightly. If these methods are unsuccessful, products are available to kill mosquito larvae, but that are harmless to animals and humans. Regular application of these products is essential. Please visit the Orange County Vector Control website for more information at www.ocvcd.org/mosquitoes3.php.

Rain Gardens

Rain gardens allow runoff to be directed from your roof downspout into a landscaped area. Vegetation and rocks in the garden will slow the flow of water to allow for infiltration into the soil. Plants and soil particles will absorb pollutants from the roof runoff. By utilizing a native plant palate, rain gardens can be maintained all year with minimal additional irrigation. These plants are adapted to the semi-arid climate of Southern California, require less water and can reduce your water bill.

Before modifying your yard to install a rain garden, please consult your local building and/or planning departments to ensure your garden plan follows pertinent building codes and ordinances. Besides codes and ordinances, some home owner associations also have guidelines for yard modifications. If your property is in hill areas or includes engineered slopes, please seek professional advice before proceeding with changes.



For information on how to disconnect a downspout or to install and maintain a rain barrel or rain garden at your home, please see the Los Angeles Rainwater Harvesting Program, A Homeowner's "How-To" Guide, November 2009 at www.larainwaterharvesting.org/

OTHER WATER CONSERVATION AND POLLUTION PREVENTION TECHNIQUES

Native Vegetation and Maintenance

"California Friendly" plants or native vegetation can significantly reduce water use. These plants often require far less fertilizers and pesticides, which are two significant pollutants found in Orange County waterways. Replacing water "thirsty" plants and grass types with water efficient natives is a great way to save water and reduce the need for potentially harmful pesticides and fertilizer.

Please see the California Friendly Garden Guide produced by the Metropolitan Water District of Southern California and associated Southern California Water Agencies for a catalog of California friendly plants and other garden resources at www.bewaterwise.com/Gardensoft.

Weed Free Yards

Weeds are water thieves. They often reproduce quickly and rob your yard of both water and nutrients. Weed your yard by hand if possible. If you use herbicides to control the weeds, use only the amount recommended on the label and never use it if rain is forecast within the next 48 hours.

Soil Amendments

Soil amendments such as green waste (e.g. grass clippings, compost, etc.) can be a significant source of nutrients and can help keep the soil near the roots of plants moist. However, they can cause algal booms if they get into our waterways, which reduces the amount of oxygen in the water and impacts most aquatic organisms. It is important to apply soil amendments more than 48 hours prior to predicted rainfall.

IRRIGATE EFFICIENTLY

Water runoff from sprinklers left on too long will carry pollutants into our waterways.

Smart Irrigation Controllers

Smart Irrigation Controllers have internal clocks as well as sensors that will turn off the sprinklers in response to environmental changes. If it is raining, too windy or too cold, the smart irrigation control sprinklers will automatically shut off.

Check with your local water agency for available rebates on irrigation controllers and smart timers.

- Aim your sprinklers at your lawn, not the sidewalk – By simply adjusting the direction of your sprinklers you can save water, prevent water pollution from runoff, keep your lawn healthy and save money.
- **Set a timer for your sprinklers** – lawns absorb the water they need to stay healthy within a few minutes of turning on the sprinklers. Time your sprinklers; when water begins running off your lawn, you can turn them off. Your timer can be set to water your lawn for this duration every time.
- **Water at Sunrise** – Watering early in the morning will reduce water loss due to evaporation. Additionally, winds tend to die down in the early morning so the water will get to the lawn as intended.
- **Water by hand** – Instead of using sprinklers, consider watering your yard by hand. Hand-watering ensures that all plants get the proper amount of water and you will prevent any water runoff, which wastes water and carries pollutants into our waterways.
- **Fix leaks** - Nationwide, households waste one trillion gallons of water a year to leaks – that is enough water to serve the entire state of Texas for a year. If your garden hose is leaking, replace the nylon or rubber hose washer and ensure a tight connection. Fix broken sprinklers immediately.

Do your part to prevent water pollution in our creeks, rivers, bays and ocean.

Clean beaches and healthy creeks, rivers, bays, and ocean are important to Orange County. However, many common household activities can lead to water pollution if you're not careful.

Remember the Water in Your Storm Drain is Not Treated BEFORE It Enters Our Waterways

Litter, oil, chemicals and other substances that are left on your yard or driveway can be blown or washed into storm drains that flow to the ocean. Over-watering your lawn and washing your car can also flush materials into the storm drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated.

You would never pour soap, fertilizers or oil into the ocean, so don't let them enter streets, gutters or storm drains. Follow the easy tips in this brochure to help prevent water pollution.

For more information, please call the **Orange County Stormwater Program** at **1-877-89-SPILL** (1-877-897-7455) or visit **www.ocwatersheds.com**

To report a spill, call the **Orange County 24-Hour Water Pollution Problem Reporting Hotline 1-877-89-SPILL** (1-877-897-7455).

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while performing everyday household activities. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

GENUINE RECYCLED PAPER
50% PRE-CONSUMER AND 15% POST-CONSUMER

RECYCLE USED OIL

Help Prevent Ocean Pollution:

Household Tips

The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Pollution Prevention

Household Activities

- **Do not rinse spills with water!** Sweep outdoor spills and dispose of in the trash. For wet spills like oil, apply cat litter or another absorbent material, then sweep and bring to a household hazardous waste collection center (HHWCC).
- Securely cover trash cans.
- Take household hazardous waste to a household hazardous waste collection center.
- Store household hazardous waste in closed, labeled containers inside or under a cover.
- Do not hose down your driveway, sidewalk or patio. Sweep up debris and dispose of in trash.
- Always pick up after your pet. Flush waste down the toilet or dispose of in the trash.
- Bathe pets indoors or have them professionally groomed.

Household Hazardous Wastes include:

- ▲ **Batteries**
- ▲ **Paint thinners, paint strippers and removers**
- ▲ **Adhesives**
- ▲ **Drain openers**
- ▲ **Oven cleaners**
- ▲ **Wood and metal cleaners and polishes**
- ▲ **Herbicides and pesticides**
- ▲ **Fungicides/wood preservatives**
- ▲ **Automotive fluids and products**
- ▲ **Grease and rust solvents**
- ▲ **Thermometers and other products containing mercury**
- ▲ **Fluorescent lamps**
- ▲ **Cathode ray tubes, e.g. TVs, computer monitors**
- ▲ **Pool and spa chemicals**

Gardening Activities

- Follow directions on pesticides and fertilizers, (measure, do not estimate amounts) and do not use if rain is predicted within 48 hours.
- Water your lawn and garden by hand to control the amount of water you use. Set irrigation systems to reflect seasonal water needs. If water flows off your yard and onto your driveway or sidewalk, your system is over-watering.
- Mulch clippings or leave them on the lawn. If necessary, dispose in a green waste container.
- Cultivate your garden often to control weeds.

Washing and Maintaining Your Car

- Take your car to a commercial car wash whenever possible.
- Choose soaps, cleaners, or detergents labeled "non-toxic," "phosphate free" or "biodegradable." Vegetable and citrus-based products are typically safest for the environment, **but even these should not be allowed into the storm drain.**
- Shake floor mats into a trash can or vacuum to clean.
- Do not use acid-based wheel cleaners and "hose off" engine degreasers at home. They can be used at a commercial facility, which can properly process the washwater.
- **Do not dump washwater onto your driveway, sidewalk, street, gutter or storm drain.** Excess washwater should be disposed of in the sanitary sewers (through a sink, or toilet) or onto an absorbent surface like your lawn.
- Use a nozzle to turn off water when not actively washing down automobile.
- Monitor vehicles for leaks and place pans under leaks. Keep your car well maintained to stop and prevent leaks.
- Use cat litter or other absorbents and sweep to remove any materials deposited by vehicles. Contain sweepings and dispose of at a HHWCC.
- Perform automobile repair and maintenance under a covered area and use drip pans or plastic sheeting to keep spills and waste material from reaching storm drains.
- **Never pour oil or antifreeze in the street, gutter or storm drains.** Recycle these substances at a service station, HHWCC, or used oil recycling center. For the nearest Used Oil Collection Center call 1-800-CLEANUP or visit www.ciwmb.ca.gov/UsedOil.

For locations and hours of Household Hazardous Waste Collection Centers in Anaheim, Huntington Beach, Irvine and San Juan Capistrano, call (714)834-6752 or visit www.oclandfills.com.

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities such as pest control can lead to water pollution if you're not careful. Pesticide treatments must be planned and applied properly to ensure that pesticides do not enter the street, gutter or storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never dump pesticides into the ocean, so don't let it enter the storm drains. Pesticides can cause significant damage to our environment if used improperly. If you are thinking of using a pesticide to control a pest, there are some important things to consider.

For more information,
please call
University of California Cooperative
Extension Master Gardeners at
(714) 708-1646
or visit these Web sites:
www.uccemg.org
www.ipm.ucdavis.edu

For instructions on collecting a specimen sample visit the Orange County Agriculture Commissioner's website at:
http://www.ocagcomm.com/ser_lab.asp

To report a spill, call the
Orange County 24-Hour Water Pollution Problem Reporting Hotline at 1-877-89-SPILL (1-877-897-7455).

For emergencies, dial 911.

Information From:
Cheryl Wilen, Area IPM Advisor; Darren Haver, Watershed Management Advisor; Mary Louise Flint, IPM Education and Publication Director; Pamela M. Geisel, Environmental Horticulture Advisor; Carolyn L. Unruh, University of California Cooperative Extension staff writer. Photos courtesy of the UC Statewide IPM Program and Darren Haver.

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Help Prevent Ocean Pollution:

Responsible Pest Control

Tips for Pest Control

Key Steps to Follow:

Step 1: **Correctly identify the pest (insect, weed, rodent, or disease) and verify that it is actually causing the problem.**

Three life stages of the common lady beetle, a beneficial insect.

This is important because beneficial insects are often mistaken for pests and sprayed with pesticides needlessly.

Consult with a Certified Nursery Professional at a local nursery or garden center or send a sample of the pest to the Orange County Agricultural Commissioner's Office.

Determine if the pest is still present – even though you see damage, the pest may have left.

Step 2: **Determine how many pests are present and causing damage.**

Small pest populations may be controlled more safely using non-pesticide techniques. These include removing food sources, washing off leaves with a strong stream of water, blocking entry into the home using caulking and replacing problem plants with ones less susceptible to pests.

Integrated Pest Management (IPM) usually combines several least toxic pest control methods for long-term prevention and management of pest problems without harming you, your family, or the environment.

UC CE University of California Cooperative Extension

Step 3: **If a pesticide must be used, choose the least toxic chemical.**

Obtain information on the least toxic pesticides that are effective at controlling the target pest from the UC Statewide Integrated Pest Management (IPM) Program's Web site at www.ipm.ucdavis.edu.

Seek out the assistance of a Certified Nursery Professional at a local nursery or garden center when selecting a pesticide. Purchase the smallest amount of pesticide available.

Apply the pesticide to the pest during its most vulnerable life stage. This information can be found on the pesticide label.

Step 4: **Wear appropriate protective clothing.**

Follow pesticide labels regarding specific types of protective equipment you should wear. Protective clothing should always be washed separately from other clothing.

Step 5: **Continuously monitor external conditions when applying pesticides such as weather, irrigation, and the presence of children and animals.**

Never apply pesticides when rain is predicted within the next 48 hours. Also, do not water after applying pesticides unless the directions say it is necessary.

Apply pesticides when the air is still; breezy conditions may cause the spray or dust to drift away from your targeted area.

In case of an emergency call 911 and/or the regional poison control number at (714) 634-5988 or (800) 544-4404 (CA only).

For general questions you may also visit www.calpoison.org.

Step 6: **In the event of accidental spills, sweep up or use an absorbent agent to remove any excess pesticides. Avoid the use of water.**

Be prepared. Have a broom, dust pan, or dry absorbent material, such as cat litter, newspapers or paper towels, ready to assist in cleaning up spills.

Contain and clean up the spill right away. Place contaminated materials in a doubled plastic bag. All materials used to clean up the spill should be properly disposed of according to your local Household Hazardous Waste Disposal site.

Step 7: **Properly store and dispose of unused pesticides.**

Purchase Ready-To-Use (RTU) products to avoid storing large concentrated quantities of pesticides.

Store unused chemicals in a locked cabinet.

Unused pesticide chemicals may be disposed of at a Household Hazardous Waste Collection Center.

Empty pesticide containers should be triple rinsed prior to disposing of them in the trash.

Household Hazardous Waste Collection Center
(714) 834-6752
www.oclandfills.com

PROJECT Pollution PREVENTION

Sewage Spill Regulatory Requirements

Allowing sewage to discharge to a gutter or storm drain may subject you to penalties and/or out-of-pocket costs to reimburse cities or public agencies for clean-up efforts.

Here are the pertinent codes, fines, and agency contact information that apply.

Orange County Stormwater Program
24 Hour Water Pollution Reporting Hotline
1-877-89-SPILL (1-877-897-7455)

- County and city water quality ordinances prohibit discharges containing pollutants.

Orange County Health Care Agency Environmental Health
(714) 433-6419

California Health and Safety Code, Sections 5410-5416

- No person shall discharge raw or treated sewage or other waste in a manner that results in contamination, pollution or a nuisance.
- Any person who causes or permits a sewage discharge to any state waters:
  - must immediately notify the local health agency of the discharge.
  - shall reimburse the local health agency for services that protect the public's health and safety (water-contact receiving waters).
  - who fails to provide the required notice to the local health agency is guilty of a misdemeanor and shall be punished by a fine (between $500–$1,000) and/or imprisonment for less than one year.

Regional Water Quality Control Board
Santa Ana Region (951) 782-4130
San Diego Region (858) 467-2952

- Requires the prevention, mitigation, response to and reporting of sewage spills.

California Office of Emergency Services
(800) 852-7550

California Water Code, Article 4, Chapter 4, Sections 13268-13271
California Code of Regulations, Title 23, Division 3, Chapter 9.2, Article 2, Sections 2250-2260

- Any person who causes or permits sewage in excess of 1,000 gallons to be discharged to state waters **shall immediately notify the Office of Emergency Services.**
- Any person who fails to provide the notice required by this section is **guilty of a misdemeanor** and shall be punished by a fine (less than $20,000) and/or imprisonment for not more than one year.

DTP113 Rev 4/06
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Sewage Spill
Reference Guide

Your Responsibilities as a Private Property Owner

Residences
Businesses
Homeowner/Condominium Associations
Federal and State Complexes
Military Facilities

Orange County Sanitation District

Health Care Agency
Environmental Health

PROJECT Pollution PREVENTION
www.ocwatersheds.com

This brochure was designed courtesy of the Orange County Sanitation District (OCSD). For additional information, call (714) 962-2411, or visit their website at www.ocsd.com

What is a Sewage Spill?

Sewage spills occur when the wastewater being transported via underground pipes overflows through a manhole, cleanout or broken pipe. Sewage spills can cause health hazards, damage to homes and businesses, and threaten the environment, local waterways and beaches.

Common Causes of Sewage Spills

Grease builds up inside and eventually blocks sewer pipes. Grease gets into the sewer from food establishments, household drains, as well as from poorly maintained commercial grease traps and interceptors.

Structure problems caused by tree roots in the lines, broken/cracked pipes, missing or broken cleanout caps or undersized sewers can cause blockages.

Infiltration and inflow (I/I) impacts pipe capacity and is caused when groundwater or rainwater enters the sewer system through pipe defects and illegal connections.

You Are Responsible for a Sewage Spill Caused by a Blockage or Break in Your Sewer Lines!

Time is of the essence in dealing with sewage spills. You are required to **immediately**:

Control and minimize the spill. Keep spills contained on private property and out of gutters, storm drains and public waterways by shutting off or not using the water.

Use sandbags, dirt and/or plastic sheeting to prevent sewage from entering the storm drain system.

Clear the sewer blockage. Always wear gloves and wash your hands. It is recommended that a plumbing professional be called for clearing blockages and making necessary repairs.

Always notify your city sewer/public works department or public sewer district of sewage spills. If the spill enters the storm drains also notify the Health Care Agency. In addition, if it exceeds 1,000 gallons notify the Office of Emergency Services. Refer to the numbers listed in this brochure.

Overflowing cleanout pipe located on private property

You Could Be Liable

Allowing sewage from your home, business or property to discharge to a gutter or storm drain may subject you to penalties and/or out-of-pocket costs to reimburse cities or public agencies for clean-up and enforcement efforts. See Regulatory Codes & Fines section for pertinent codes and fines that apply.

What to Look For

Sewage spills can be a very noticeable gushing of water from a manhole or a slow water leak that may take time to be noticed. Don't dismiss unaccounted-for wet areas.

Look for:

- Drain backups inside the building.
- Wet ground and water leaking around manhole lids onto your street.
- Leaking water from cleanouts or outside drains.
- Unusual odorous wet areas: sidewalks, external walls or ground/landscape around a building.

Caution

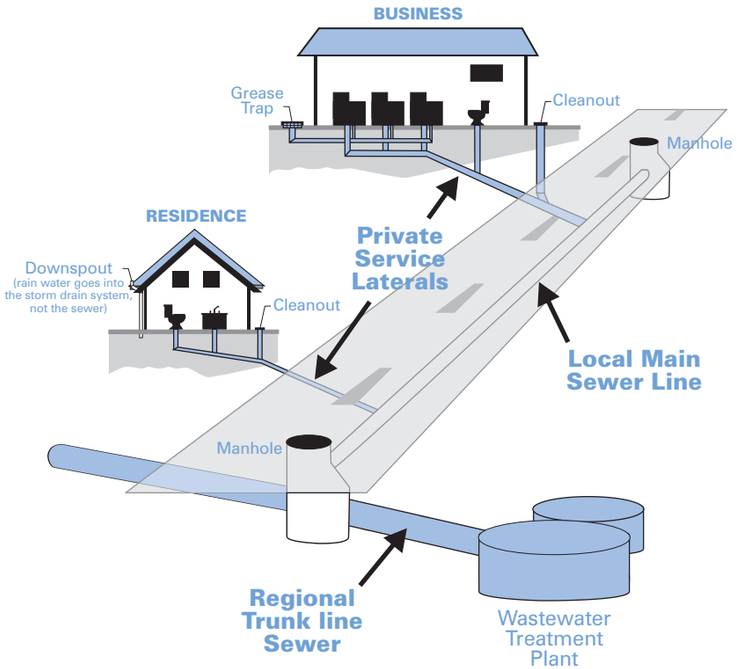
Keep people and pets away from the affected area. Untreated sewage has high levels of disease-causing viruses and bacteria. Call your local health care agency listed on the back for more information.

If You See a Sewage Spill Occurring, Notify Your City Sewer/Public Works Department or Public Sewer District IMMEDIATELY!

How a Sewer System Works

A property owner's sewer pipes are called service laterals and are connected to larger local main and regional trunk lines. Service laterals run from the connection at the home to the connection with the public sewer (including the area under the street). These laterals are the responsibility of the property owner and must be maintained by the property owner. Many city agencies have adopted ordinances requiring maintenance of service laterals. Check with your city sewer/local public works department for more information.

Operation and maintenance of **local and regional sewer lines** are the responsibility of the city sewer/public works departments and public sewer districts.



How You Can Prevent Sewage Spills

1. **Never put grease down garbage disposals, drains or toilets.**
2. **Perform periodic cleaning to eliminate grease, debris and roots in your service laterals.**
3. **Repair any structural problems in your sewer system and eliminate any rainwater infiltration/inflow leaks into your service laterals.**

Preventing Grease Blockages

The drain is not a dump! Recycle or dispose of grease properly and never pour grease down the drain.

Homeowners should mix fats, oils and grease with absorbent waste materials such as paper, coffee grounds, or kitty litter and place it in the trash. Wipe food scraps from plates and pans and dump them in the trash.

Restaurants and commercial food service establishments should always use "Kitchen Best Management Practices." These include:

- Collecting all cooking grease and liquid oil from pots, pans and fryers in covered grease containers for recycling.
- Scraping or dry-wiping excess food and grease from dishes, pots, pans and fryers into the trash.
- Installing drain screens on all kitchen drains.
- Having spill kits readily available for cleaning up spills.
- Properly maintaining grease traps or interceptors by having them serviced regularly. Check your local city codes.

Orange County Agency Responsibilites

- **City Sewer/Public Works Departments—** Responsible for protecting city property and streets, the local storm drain system, sewage collection system and other public areas.
- **Public Sewer/Sanitation District—** Responsible for collecting, treating and disposing of wastewater.
- **County of Orange Health Care Agency—** Responsible for protecting public health by closing ocean/bay waters and may close food-service businesses if a spill poses a threat to public health.
- **Regional Water Quality Control Boards—** Responsible for protecting State waters.
- **Orange County Stormwater Program—** Responsible for preventing harmful pollutants from being discharged or washed by stormwater runoff into the municipal storm drain system, creeks, bays and the ocean.

You Could Be Liable for Not Protecting the Environment

Local and state agencies have legal jurisdiction and enforcement authority to ensure that sewage spills are remedied.

They may respond and assist with containment, relieving pipe blockages, and/or clean-up of the sewage spill, especially if the spill is flowing into storm drains or onto public property.

A property owner may be charged for costs incurred by these agencies responding to spills from private properties.

Report Sewage Spills!

City Sewer/Public Works Departments

Aliso Viejo	(949) 425-2500
Anaheim	(714) 765-6860
Brea	(714) 990-7691
Buena Park	(714) 562-3655
Costa Mesa	(949) 645-8400
Cypress	(714) 229-6760
Dana Point	(949) 248-3562
Fountain Valley	(714) 593-4600
Fullerton	(714) 738-6897
Garden Grove	(714) 741-5375
Huntington Beach	(714) 536-5921
Irvine	(949) 453-5300
Laguna Beach	(949) 497-0765
Laguna Hills	(949) 707-2650
Laguna Niguel	(949) 362-4337
Laguna Woods	(949) 639-0500
La Habra	(562) 905-9792
Lake Forest	(949) 461-3480
La Palma	(714) 690-3310
Los Alamitos	(562) 431-3538
Mission Viejo	(949) 831-2500
Newport Beach	(949) 644-3011
Orange	(714) 532-6480
Orange County	(714) 567-6363
Placentia	(714) 993-8245
Rancho Santa Margarita	(949) 635-1800
San Clemente	(949) 366-1553
San Juan Capistrano	(949) 443-6363
Santa Ana	(714) 647-3380
Seal Beach	(562) 431-2527
Stanton	(714) 379-9222
Tustin	(714) 962-2411
Villa Park	(714) 998-1500
Westminster	(714) 893-3553
Yorba Linda	(714) 961-7170

Public Sewer/Water Districts

Costa Mesa Sanitary District	(714) 393-4433/ (949) 645-8400
El Toro Water District	(949) 837-0660
Emerald Bay Service District	(949) 494-8571
Garden Grove Sanitary District	(714) 741-5375
Irvine Ranch Water District	(949) 453-5300
Los Alamitos/Rossmoor Sewer District	(562) 431-2223
Midway City Sanitary District (Westminster)	(714) 893-3553
Moulton Niguel Water District	(949) 831-2500
Orange County Sanitation District	(714) 962-2411
Santa Margarita Water District	(949) 459-6420
South Coast Water District	(949) 499-4555
South Orange County Wastewater Authority	(949) 234-5400
Sunset Beach Sanitary District	(562) 493-9932
Trabuco Canyon Sanitary District	(949) 858-0277
Yorba Linda Water District	(714) 777-3018

Other Agencies

Orange County Health Care Agency	(714) 433-6419
Office of Emergency Services	(800) 852-7550

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, not properly disposing of used oil is illegal and can lead to fines. If you pour or drain oil onto driveways, sidewalks or streets, it can be washed into the storm drain.

Help prevent water pollution by taking your used oil and oil filters to a used oil collection center. Most major automotive maintenance centers will accept up to five gallons of used motor oil at no cost. For a list of locations, please visit www.cleanup.org.

For more information, please call the **Orange County Stormwater Program** at **1-877-89-SPILL (1-877-897-7455)** or visit **www.ocwatersheds.com.**

For information about the proper disposal of household hazardous waste, call the **Household Waste Hotline** at **1-877-89-SPILL (1-877-897-7455)** or visit **www.oclandfills.com.**

For additional information about the nearest oil recycling center, call the **Used Oil Program** at **1-800-CLEANUP** or visit **www.cleanup.org.**

RECYCLE USED OIL

emc/rev9/08

Help Prevent Ocean Pollution:

Tips for the Home Mechanic

PROJECT Pollution PREVENTION

The Ocean Begins at Your Front Door

Tips for the Home Mechanic

WORK SITE

- Locate the storm drains on or near your property. Do not allow used oil or any materials to flow into these drains.
- Examine your home for sources of pollution.
- Perform automotive projects under cover and in a controlled area to prevent stormwater runoff.
- Sweep or vacuum your automotive workspace regularly
- Use a damp mop to clean work areas. Never hose down surfaces into the street, gutter or storm drain.

- Pour mop water into a sink or toilet. Never dispose of water in a parking lot, street, gutter or storm drain.

PREVENT LEAKS AND SPILLS

- Keep absorbent materials such as rags and/or cat litter in the work area
- Empty drip pans into a labeled, seal container before they are full
- Wipe up any spills or repair leaks as they happen. Don't let them sit.
- Place large pans under any wrecked cars until all fluids are drained.
- Promptly dispose of collected fluids into a hazardous waste drum or deliver them to an oil recycling center. Used oil recycling locations can be found at http://www.ochealthinfo.com/regulatory/usedoil.htm

CLEANING SPILLS

- Clean up spills immediately by using absorbent material such as rags, cat litter or sand. If the material spilled is hazardous, dispose of the rag, litter or sand in the same manner as hazardous waste. If the material spill is non-hazardous, dispose of it in the trash.

- Immediately report spills that have entered the street, gutter or storm drain to the County's 24-Hour Water Pollution Problem Reporting Hotline at 1-877-89-SPILL (1-877-897-7455) or visit www.ocwatersheds.com to fill out an incident report.
- Report emergencies to 911.

VEHICLE FLUID MANAGEMENT

- Vehicle fluids are hazardous waste and must be stored and disposed of in accordance with all local, state and federal laws.
- Designate an area to drain vehicle fluids away from storm drains and sanitary drains.
- When possible, drain vehicle fluids indoors or within covered areas, and only over floors that are constructed of a non-porous material such as concrete. Asphalt and dirt floors absorb spilled or leaked fluids, making the cleanup extremely difficult.

PROJECT Pollution PREVENTION

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Home improvement projects and work sites must be maintained to ensure that building materials do not enter the street, gutter or storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never dump building materials into the ocean, so don't let them enter the storm drains. Follow these tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

To report a spill,
call the
Orange County 24-Hour
Water Pollution Problem
Reporting Hotline
at **1-877-89-SPILL** (1-877-897-7455).

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while performing home improvement projects. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

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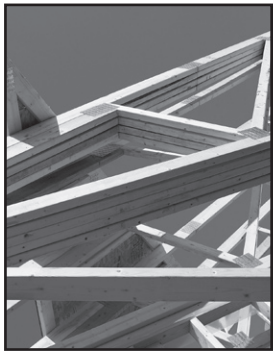
Help Prevent Ocean Pollution:

Tips for Home Improvement Projects

Tips for Home Improvement Projects

Home improvement projects can cause significant damage to the environment. Whether you hire a contractor or work on the house yourself, it is important to follow these simple tips while renovating, remodeling or improving your home:

General Construction



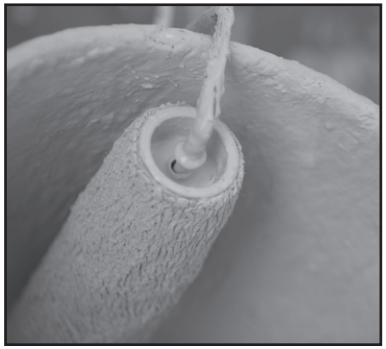
- Schedule projects for dry weather.
- Keep all construction debris away from the street, gutter and storm drain.
- Store materials under cover with temporary roofs or plastic sheets to eliminate or reduce the possibility that rainfall, runoff or wind will carry materials from the project site to the street, storm drain or adjacent properties.

Building Materials

- Never hose materials into a street, gutter or storm drain.
- Exposed piles of construction material should not be stored on the street or sidewalk.
- Minimize waste by ordering only the amount of materials needed to complete the job.
- Do not mix more fresh concrete than is needed for each project.
- Wash concrete mixers and equipment in a designated washout area where the water can flow into a containment area or onto dirt.
- Dispose of small amounts of dry excess materials in the trash. Powdery waste, such as dry concrete, must be properly contained within a box or bag prior to disposal. Call your local trash hauler for weight and size limits.

Paint

- Measure the room or object to be painted, then buy only the amount needed.
- Place the lid on firmly and store the paint can upside-down in a dry location away from the elements.
- Tools such as brushes, buckets and rags should never be washed where excess water can drain into the street, gutter or storm drain. All tools should be rinsed in a sink connected to the sanitary sewer.
- When disposing of paint, never put wet paint in the trash.
- Dispose of water-based paint by removing the lid and letting it dry in the can. Large amounts must be taken to a Household Hazardous Waste Collection Center (HHWCC).



- Oil-based paint is a household hazardous waste. All leftover paint should be taken to a HHWCC.
- For HHWCC locations and hours, call **(714) 834-6752** or visit **www.oclandfills.com**.

Erosion Control

- Schedule grading and excavation projects for dry weather.
- When temporarily removing soil, pile it in a contained, covered area where it cannot spill into the street, or obtain the required temporary encroachment or street closure permit and follow the conditions instructed by the permit.
- When permanently removing large quantities of soil, a disposal location must be found prior to excavation. Numerous businesses are available to handle disposal needs. For disposal options, visit **www.ciwmb.ca.gov/SWIS**.
- Prevent erosion by planting fast-growing annual and perennial grasses. They will shield and bind the soil.

Recycle

- Use a construction and demolition recycling company to recycle lumber, paper, cardboard, metals, masonry (bricks, concrete, etc.), carpet, plastic, pipes (plastic, metal and clay), drywall, rocks, dirt and green waste.

- For a listing of construction and demolition recycling locations in your area, visit **www.ciwmb.ca.gov/recycle.**

Spills

- Clean up spills immediately by using an absorbent material such as cat litter, then sweep it up and dispose of it in the trash.
- Immediately report spills that have entered the street, gutter or storm drain to the County's 24-Hour Water Pollution Problem Reporting Hotline at **(714) 567-6363** or visit **www.ocwatersheds.com** to fill out an incident reporting form.

PROJECT Pollution PREVENTION

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Fertilizers, pesticides and other chemicals that are left on yards or driveways can be blown or washed into storm drains that flow to the ocean. Overwatering lawns can also send materials into storm drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never pour gardening products into the ocean, so don't let them enter the storm drains. Follow these easy tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

UCCE Master Gardener Hotline:
(714) 708-1646

To report a spill,
call the
Orange County 24-Hour
Water Pollution Problem
Reporting Hotline
1-877-89-SPILL (1-877-897-7455).

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while landscaping or gardening. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

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Help Prevent Ocean Pollution:

Tips for Landscape & Gardening

The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Tips for Landscape & Gardening

Never allow gardening products or polluted water to enter the street, gutter or storm drain.

General Landscaping Tips

- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Prevent erosion of slopes by planting fast-growing, dense ground covering plants. These will shield and bind the soil.
- Plant native vegetation to reduce the amount of water, fertilizers, and pesticide applied to the landscape.

- Never apply pesticides or fertilizers when rain is predicted within the next 48 hours.

Garden & Lawn Maintenance

- Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro spray systems. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.

- Use slow-release fertilizers to minimize leaching, and use organic fertilizers.
- Read labels and use only as directed. Do not over-apply pesticides or fertilizers. Apply to spots as needed, rather than blanketing an entire area.
- Store pesticides, fertilizers and other chemicals in a dry covered area to prevent exposure that may result in the deterioration of containers and packaging.

- Rinse empty pesticide containers and re-use rinse water as you would use the product. Do not dump rinse water down storm drains. Dispose of empty containers in the trash.
- When available, use non-toxic alternatives to traditional pesticides, and use pesticides specifically designed to control the pest you are targeting. For more information, visit **www.ipm.ucdavis.edu**.
- If fertilizer is spilled, sweep up the spill before irrigating. If the spill is liquid, apply an absorbent material such as cat litter, and then sweep it up and dispose of it in the trash.
- Take unwanted pesticides to a Household Hazardous Waste Collection Center to be recycled. Locations are provided below.

Household Hazardous Waste Collection Centers

Anaheim:	1071 N. Blue Gum St.
Huntington Beach:	17121 Nichols St.
Irvine:	6411 Oak Canyon
San Juan Capistrano:	32250 La Pata Ave.

For more information, call (714) 834-6752 or visit www.oclandfills.com

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Pet waste and pet care products can be washed into the storm drains that flow to the ocean. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never put pet waste or pet care products into the ocean, so don't let them enter the storm drains. Follow these easy tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

To report a spill,
call the
Orange County 24-Hour Water Pollution Problem Reporting Hotline
1-877-89-SPILL (1-877-897-7455).

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while caring for your pet. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

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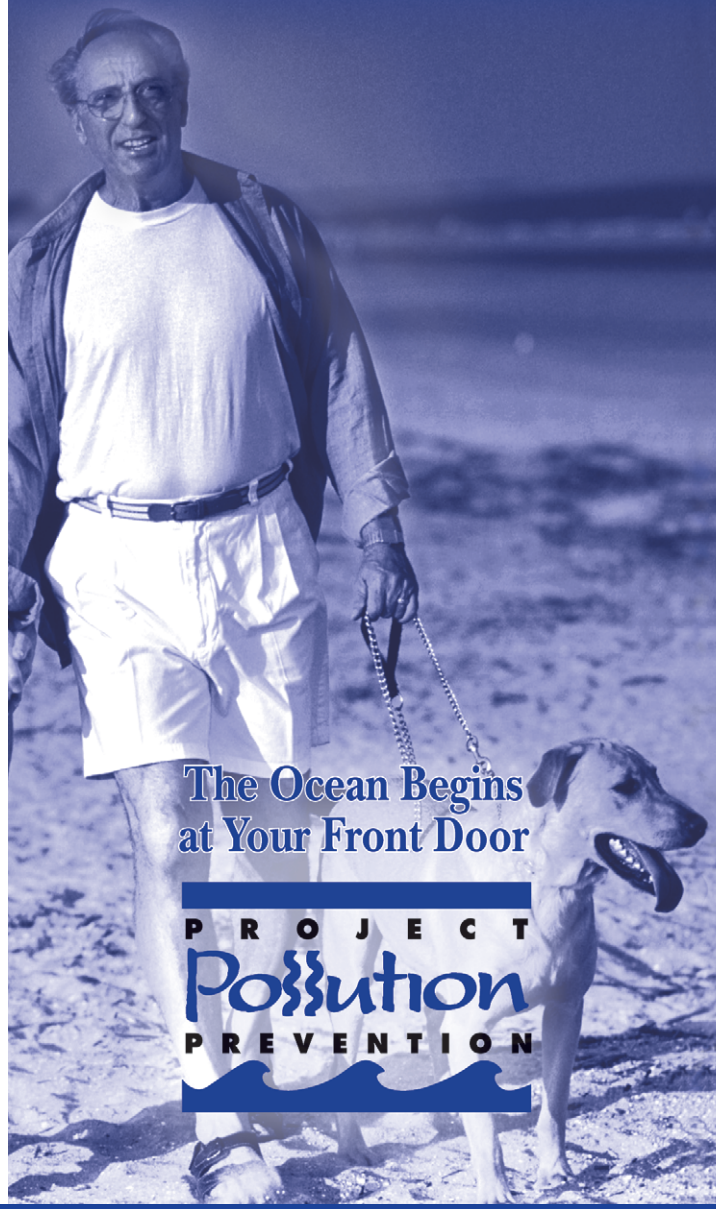
Help Prevent Ocean Pollution:

Tips for Pet Care



Tips for Pet Care

Never let any pet care products or washwater run off your yard and into the street, gutter or storm drain.

Washing Your Pets

Even biodegradable soaps and shampoos can be harmful to marine life and the environment.

- If possible, bathe your pets indoors using less-toxic shampoos or have your pet professionally groomed. Follow instructions on the products and clean up spills.

- If you bathe your pet outside, wash it on your lawn or another absorbent/ permeable surface to keep the washwater from running into the street, gutter or storm drain.

Flea Control

- Consider using oral or topical flea control products.

- If you use flea control products such as shampoos, sprays or collars, make sure to dispose of any unused products at a Household Hazardous Waste Collection Center. For location information, call **(714) 834-6752**.

Why You Should Pick Up After Your Pet

It's the law! Every city has an ordinance requiring you to pick up after your pet. Besides being a nuisance, pet waste can lead to water pollution, even if you live inland. During rainfall, pet waste left outdoors can wash into storm drains. This waste flows directly into our waterways and the ocean where it can harm human health, marine life and the environment.

As it decomposes, pet waste demands a high level of oxygen from water. This decomposition can contribute to killing marine life by reducing the amount of dissolved oxygen available to them.

Have fun with your pets, but please be a responsible pet owner by taking care of them and the environment.

- Take a bag with you on walks to pick up after your pet.

- Dispose of the waste in the trash or in a toilet.

PROJECT Pollution PREVENTION

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities such as painting can lead to water pollution if you're not careful. Paint must be used, stored and disposed of properly to ensure that it does not enter the street, gutter or storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never dump paint into the ocean, so don't let it enter the storm drains. Follow these easy tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

To report a spill,
call the
Orange County 24-Hour Water Pollution Problem Reporting Hotline
at **1-877-89-SPILL** (1-877-897-7455).

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while using, storing and disposing of paint. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

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Help Prevent Ocean Pollution:

Tips for Projects Using Paint

Tips for Projects Using Paint

Paint can cause significant damage to our environment. Whether you hire a contractor or do it yourself, it is important to follow these simple tips when purchasing, using, cleaning, storing and disposing of paint.

Purchasing Paint

- Measure the room or object to be painted, then buy only the amount needed.
- Whenever possible, use water-based paint since it usually does not require hazardous solvents such as paint thinner for cleanup.

Painting

- Use only one brush or roller per color of paint to reduce the amount of water needed for cleaning.
- Place open paint containers or trays on a stable surface and in a position that is unlikely to spill.
- Always use a tarp under the area or object being painted to collect paint drips and contain spills.

Cleaning

- Never clean brushes or rinse paint containers in the street, gutter or storm drain.
- For oil-based products, use as much of the paint on the brushes as possible. Clean brushes with thinner. To reuse thinner, pour it through a fine filter (e.g. nylon, metal gauze or filter paper) to remove solids such as leftover traces of paint.
- For water-based products, use as much of the paint on the brushes as possible, then rinse in the sink.
- Collect all paint chips and dust. Chips and dust from marine paints or paints containing lead, mercury or tributyl tin are hazardous waste. Sweep up and dispose of at a Household Hazardous Waste Collection Center (HHWCC).

Storing Paint

- Store paint in a dry location away from the elements.
- Store leftover water-based paint, oil-based paint and solvents separately in original or clearly marked containers.
- Avoid storing paint cans directly on cement floors. The bottom of the can will rust much faster on cement.
- Place the lid on firmly and store the paint can upside-down to prevent air from entering. This will keep the paint usable longer. Oil-based paint is usable for up to 15 years. Water-based paint remains usable for up to 10 years.

Alternatives to Disposal

- Use excess paint to apply another coat, for touch-ups, or to paint a closet, garage, basement or attic.
- Give extra paint to friends or family. Extra paint can also be donated to a local theatre group, low-income housing program or school.
- Take extra paint to an exchange program such as the **"Stop & Swap"** that allows you to drop off or pick up partially used home care products free of charge. **"Stop & Swap"** programs are available at most HHWCCs.
- For HHWCC locations and hours, call **(714) 834-6752** or visit **www.oclandfills.com**.

Disposing of Paint

- Never put wet paint in the trash.

For water-based paint:

- If possible, brush the leftover paint on cardboard or newspaper. Otherwise, allow the paint to dry in the can with the lid off in a well-ventilated area protected from the elements, children and pets. Stirring the paint every few days will speed up the drying.
- Large quantities of extra paint should be taken to a HHWCC.
- Once dried, paint and painted surfaces may be disposed of in the trash. When setting a dried paint can out for trash collection, leave the lid off so the collector will see that the paint has dried.

For oil-based paint:

- Oil-based paint is a household hazardous waste. All leftover paint should be taken to a HHWCC.

Aerosol paint:

- Dispose of aerosol paint cans at a HHWCC.

Spills

- Never hose down pavement or other impermeable surfaces where paint has spilled.
- Clean up spills immediately by using an absorbent material such as cat litter. Cat litter used to clean water-based paint spills can be disposed of in the trash. When cleaning oil-based paint spills with cat litter, it must be taken to a HHWCC.
- Immediately report spills that have entered the street, gutter or storm drain to the County's 24-Hour Water Pollution Problem Reporting Hotline at **(714) 567-6363** or visit **www.ocwatersheds.com** to fill out an incident reporting form.

PROJECT Pollution PREVENTION